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FACTORY

MANAGEMENT AND MAINTENANCE

JANUARY 1947

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THE LABOR CRISIS
—ITS CAUSES AND CURES

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PRODUCTION

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MAINTENANCE

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LABOR MANAGEMENT

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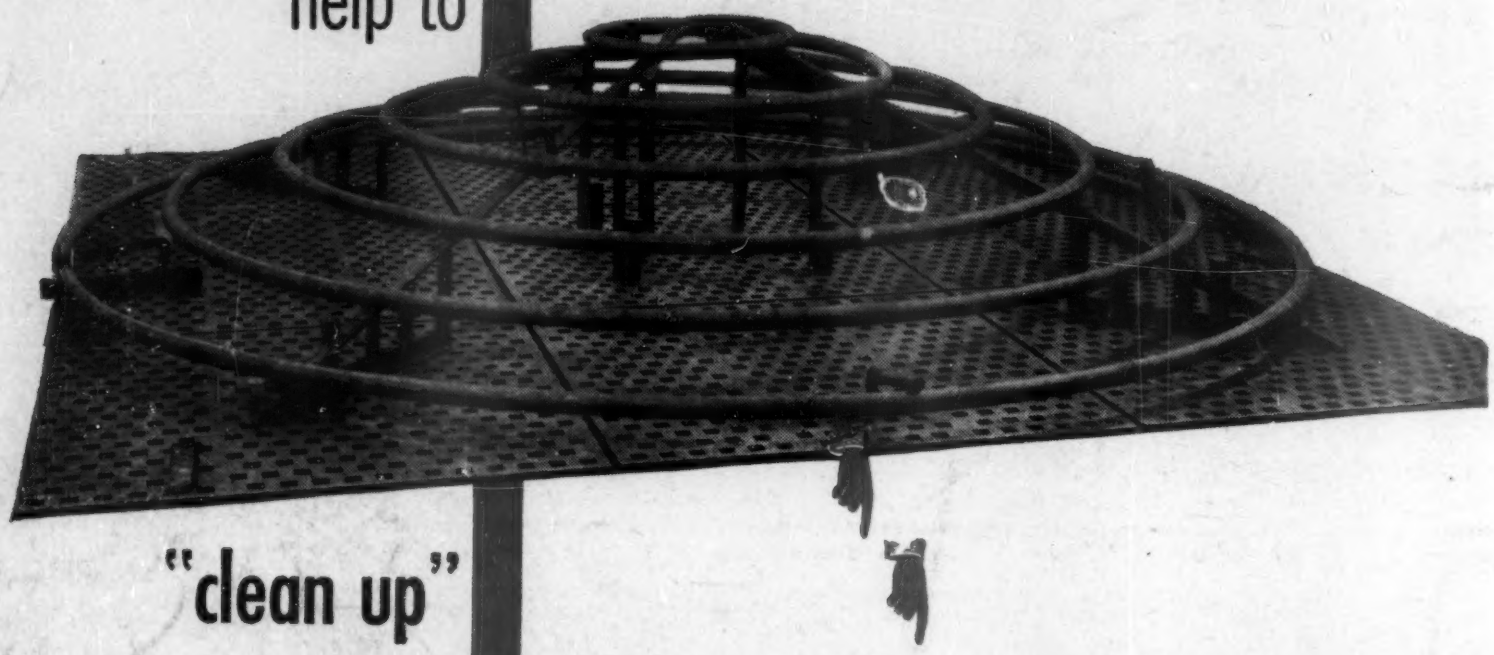

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FACTORY

MANAGEMENT and MAINTENANCE

JANUARY, 1947

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VOLUME 105, NUMBER 1 • JANUARY, 1947

production • maintenance • labor management

THE CLOSED SHOP	*preceding page*	65
IT'S BACK TO WORK WE GO—WE HOPE		65
THE LABOR CRISIS—ITS CAUSES AND CURES		66
SPEEDING UPKEEP WITH JOB SCOREBOARD		89
25 PER CENT MORE PRODUCT HANDLED AND STORED		90
CONTROLLING RAW MATERIALS TO MEET VARYING PRODUCTION		94
FALLACIES OF THE NATHAN REPORT		97
HOW TWO MEN DISTRIBUTE MILLIONS OF GALLONS OF LIQUIDS		98
DEMOCRATIC CAPITALISM IS WORTH FIGHTING FOR		102
TOWN HALL MEETINGS FOR BETTER HUMAN RELATIONS		106
STORAGE ON WHEELS CUTS HANDLING COSTS 75 PER CENT		108
WHAT'S AHEAD IN LABOR		111
WHAT'S AHEAD IN BUSINESS		112
YOUR ELECTRIC MOTOR *(Plant Operation Library No. 101)*		113
"HANDS OFF" HANDLING FOR HIGH PRODUCTIVITY		125
KEEPING MAINTENANCE COSTS IN LINE WITH FORECASTS		129
VESTIBULE SESSIONS SET STAGE FOR QUICKER ON-THE-JOB TRAINING		133
POSTERS AIM AT GREATER PRODUCTIVITY		136
BOTTLENECK CHARTS GET FIRST JOBS DONE FIRST		138
X-RAY SCREENS OUT CHEST CASES IN HIRING AND PLACING EMPLOYEES		140

departments

MANAGEMENT DATA SHEETS	143
OPERATING SHORTS *(outstanding methods briefly reported)*	146
ELECTRONIC AND HEATING EQUIPMENT REVIEW	152
WHAT'S NEW IN EQUIPMENT	156
YOU WANT TO KNOW	212
SIGNIFICANT LABOR DEVELOPMENTS	220
THEY SAY AND DO	240
BEHIND THE BYLINE *(facts about* FACTORY'S *authors)*	270
BOOKS AND BOOKLETS	276
ON THE CALENDAR *(national meetings for plant operating men)*	280
CATALOG SERVICE *(announcements of manufacturers' literature)*	286

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THE CLOSED SHOP

Key to Labor Monopoly

IF THE PEOPLE of the United States are to loosen the monopoly control now exercised by some segments of union labor and recapture the power to control their own economic and political destiny, they must come to grips with the problem of the closed shop. A satisfactory solution of that problem is as vital to the interests of the wage earner, who should be fully protected in his right to organize and bargain collectively through representatives of his own choosing, as it is vital to the interests of the nation as a whole.

By the closed shop, which unfortunately is a term that seems to shed more heat than light, I mean any shop in which the worker must make his peace with a union in order to have a job. There are approximately 13½ million union members in the United States. Of these about 10 million are governed by arrangements calling for "closed" shops, union shops, maintenance of membership provisions and similar devices which make good standing in a union a condition to holding a job.

Such arrangements raise serious issues about what is commonly presumed to be the basic American right to work. Also, closed shop arrangements lie at the root of the dominant economic power now exercised by some labor leaders.

The problem of reducing the power of these labor leaders to proportions that make it safe for democracy is the age-old problem of monopoly. In an earlier era this problem was created largely by businessmen who sought to escape the restraints of competition by combinations or agreements to control prices and production. Such efforts are still attempted and must be curbed by law.

Union Labor Monopoly

But, after more than a decade during which a monopoly position for organized labor has been aggressively promoted by the federal government, the major monopolists today are those labor leaders who wield the power of enormous nationwide unions. About 90% of the soft coal miners do the bidding of John L. Lewis. A like percentage of the auto workers are represented by the United Automobile Workers of the C. I. O. About 80% of the production workers in steel are members of the United Steel Workers, C. I. O. No single corporation has more than a fraction of the economic power that is concentrated in these unions. And if corporations were to combine their power to cope effectively with that of these union monopolies they would unquestionably find themselves charged with violating the federal antitrust laws.

In its national sweep, the monopoly power of unions rests largely on their exemption from the federal antitrust laws. My previous editorial in this series (the 53rd) discussed the desirability of removing that exemption. The local roots of this monopoly power are often embedded in closed shop arrangements.

Closed Shop in Coal

An illuminating case in point is provided by the United Mine Workers, whose leader John L. Lewis has graciously given the country a 3½-month reprieve from "the hysteria and frenzy of an economic crisis," as he himself termed it. During that latest crisis the dispatches from the soft coal fields reported that the miners were standing behind John L. Lewis almost to a man. And the implication usually was that the driving forces of the strike were loyalty to Lewis and the prospect of economic gain.

Underlying that performance, however, and basic to it was an agreement in the soft coal fields providing that "as a condition of employment all employees shall be members of the United Mine Workers." Hence to hold a job in 90% of the soft coal industry which is governed by contracts with the United Mine Workers, a miner must not offend the union. To avoid offense the union member must even be careful in criticising what his union

does. *Suspension from the union for six months, and hence from the right to hold a job,* is the penalty imposed by the United Mine Workers constitution for circulating a statement "wrongfully condemning any decision rendered by any officer of the organization."

The willingness of the miners to follow Lewis until the country froze over was not, of course, exclusively a product of the agreement limiting jobs in the coal fields to union members of good standing. Some of it originated in bad handling of employee relations in the coal fields in years gone by. But the fact remains that Lewis' soft coal monopoly has as one of its principal foundations an agreement which gives the United Mine Workers a job-or-no-job hold on 90% of the soft coal miners.

In its extreme form, the closed shop not only makes union membership a condition of employment but narrowly limits the numbers admitted to union membership and hence to the opportunity to work. In this way it is used to enforce restriction of output and working rules which would never stand up under free competition.

Fair Dealing

The closed shop raises major issues of personal freedom and fair dealing between individuals. As matters now stand, closed shop agreements require employers to discharge workers who lose their good standing in the unions involved. At the same time they frequently impose no requirement on unions to grant membership to law abiding and technically qualified persons. Many unions with closed shop agreements refuse to grant membership on the basis of competence. Thus, qualified workers are denied a fair chance to hold a job.

In its dealings with the closed shop issue the federal government has been pushed into a self-contradictory position. The National Labor Relations Act (the Wagner Act) provides, and properly, that "employees shall have the right . . . to bargain collectively through representatives of their own choosing." In furtherance of that basic proposition, the Wagner Act also provides that "It shall be an unfair labor practice for an employer . . . by discrimination in regard to hire or tenure of employment to encourage or discourage membership in any labor organization . . ." Standing alone, the provision would clearly outlaw the closed shop.

But then, to favor the closed shop, the Wagner Act turns right around and provides that "nothing in this Act . . . shall preclude an employer from making an agreement with a labor organization . . . to require, as a condition of employment, membership therein," provided that certain conditions of representation are fulfilled. This places the National Labor Relations Board in the impossible position of trying to administer a law which simultaneously points in opposite directions.

In successfully contending that there should be no closed shop arrangements on the railroads, the late Joseph Eastman, Federal Co-ordinator of Transportation, said, "If genuine freedom of choice is to be the basis of labor relations under the Railway Labor Act, as it should be, then the yellow dog contract and his corollary, the closed shop . . . have no place in the picture." The so-called yellow dog contract, which requires a worker to agree not to join a union as a condition of employment, has long since been outlawed.

At one time the closed shop was defended as a protective device for feeble young unions struggling against predatory employers. But a mere glance over the current economic scene discloses that the time when that argument was supported by the facts is past. Now it is the labor leaders who frequently exercise decisive economic power.

At elections in November three more states, Arizona, Nebraska and South Dakota, passed constitutional amendments outlawing the closed shop. In doing so, they joined six other states, which, in one way or another, have restricted the closed shop. The South Dakota amendment presented the basic issue created by the closed shop in simple and direct terms when it declared that "The right of persons to work shall not be denied or abridged on account of membership or non-membership in any labor union, or labor organization."

That issue must be squarely faced by the new Congress if its first order of business, the labor crisis, is to be resolved.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

THIS IS THE 54TH OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE

L. C. MORROW, EDITOR

IT'S BACK TO WORK WE GO—WE HOPE

In 1947 it will be more necessary than ever—and more difficult than ever—for management to keep its attention focused on the main objective of industry. That objective is the production of more and more goods for more and more people—just as it has been for a good many years. It is an objective that cannot be attained by not working.

The formula for high standard of living was evolved in the United States. The beginning of widespread understanding concerning it was a result of Ford's five-dollar wage. Thereafter there was gradual acceptance of the philosophy that efficient operation in manufacture is accompanied by production costs so low that selling prices of industry's products can be low, and the products, therefore, more widely available to consumers. It is a part of the philosophy that high wages are a concomitant of low-cost production and wide distribution.

When low-cost production is achieved, it is the result of several forces pulling together:

a. Design of product suitable for both manufacture and sales.

b. Manufacturing equipment, tooling, and methods that will minimize waste of machine time, manpower, and materials.

c. Effort of workers that will secure both volume and quality of output.

When these forces pull together smoothly, the beneficent industrial cycle brings about, in the order given: Low-cost production; high wages; low selling prices; increasing sales. As volume of sales increases and, therefore, volume of manufacture, the economies of production increase.

To bring about the distribution of the products of industry to more and more people, it is essential that the purchasing power of incomes be continually increased. During our machine age it has so worked out that this increase has been achieved by two procedures in operation at the same time:

1. Paying increased wages made available by increased production.

2. Reducing the selling prices of industry's products.

It is the beneficent cycle described here that must go on despite the strife and turmoil concerning how the fruits of production are to be distributed, and when.

It is not difficult to see that if industry produced nothing there would be nothing to distribute. It is more difficult to see that we can have plenty to distribute only as plenty is produced; and that there is a controlling relationship between what we can produce and the amount of materials, power, and human energy put into producing them. If only the people in industry would produce the things the country needs and wants!

So there is management's job for 1947—to get everybody back to work and keep them there. We hope that's what is going to happen.

L. C. Morrow

The Labor

Its Causes and Cures

Good labor relations cannot be legislated. They must be the product of cooperation by informed management and labor working toward mutual objectives.

But good labor relations cannot be established and maintained unless based on labor laws that treat management and labor alike. That is something the present labor laws do not do, and, for that reason, they are certain to be revised by the Congress now in session.

Management should and will influence the forthcoming labor law revisions. In order to do so with fairness, management must know what has brought about the present crisis and what remedies should be recommended.

In the following pages the readers of FACTORY will find a full report of the situation as it exists today and what led up to it, as well as an analysis of the labor-law revisions that have been proposed.

CONTENTS OF THIS ARTICLE

- ★ The Problems We Face ..... PAGE 67
- ★ Shortcomings of Present Laws — Revisions That Have Been Proposed 70
- ★ Portal-to-Portal Pay — Questions and Answers 74
- ★ Evolution of Labor Laws — and Strike Record 76
- ★ What Factory Workers Want in Labor Legislation 78
- ★ What Management and Labor Leaders Say Should Be Done 82
- ★ What Congress Is Likely to Do 85
- ★ Good Labor Relations Are the Responsibility of All of Us 88

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Crisis

Press Association

☆ The Problems We Face

This country needs changes in its labor laws. Today the laws permit — sometimes invite — action on the part of organized labor which is not for the good of the nation as a whole.

The need for labor law revision is brought forcibly to our attention by reason of the deeds of organized labor under the laws. No doubt some of the actions taken by labor should not have been taken. *But the all-important fact is that the laws make it possible for them to be taken.*

The National Labor Relations Act is the law that needs changing most. It is a poor law and has always been a poor law. First the depression, and then the war, kept us from knowing how bad a law it is.

But during the first year after V-J Day we found out. In that period 42 major strikes, each involving 10,000 or more workers, were staged. Eight strikes involved from 100,000 to 700,000 workers. The December coal strike ran the total of man-days lost directly in strikes in 1946 to an estimated 112,000,000 — about three times as many as have been lost in any other year since the Bureau of Labor Statistics began compiling strike-loss figures in 1926. Indirect losses, the millions of man-days lost as industry was forced to lay off men when supplies petered out, were literally uncountable. In terms of money, the statisticians ran up a total of $2,000,000,000 worth of goods and services lost in last spring's coal strike, then threw in the sponge. New York, Pittsburgh, St. Louis, and many other major cities were blighted repeatedly.

It is not good to have such far-reaching interruptions to production. It is not good for industry. It is not good for the public. And it is not good for labor. In the long run, such excesses as we have had must be prevented by constructive laws, written in the interest of the national welfare, or they will be prevented by punitive legislation pointed at organized labor.

Only an insignificant minority wants to destroy unions, to deprive labor of its rightful gains, to end the right to strike, to scrap collective bargaining.

But a majority of public, industry, and labor wants to prevent the economic losses resulting from labor strife. It wants to find lawful ways to insure:

That labor unions will be responsible for living up to contracts.

That unions, as well as management, will be obligated to bargain.

That workers will stay on the job during contract negotiations.

That the rights of individual employees will be protected against coercion.

That the abuses of mass picketing will be prevented.

That the collection and administration by unions

of funds for pensions, health programs, and the like will be regulated.

That the status of foremen and supervisors will be made clear.

That the public will be afforded protection against strikes that imperil its welfare.

That losses by reason of sympathetic strikes, secondary boycotts, and jurisdictional disputes will be eliminated.

And that broad labor monopolies will be prevented.

It is too much that the powers which permit such actions, granted by our labor laws, should be allowed to continue to exist. It is too much because of the damage that can be done when they are used singly. And it would be terrible indeed if the powers should be used in concerted or mass strike action.

The problems that the Congress must try to solve are many. Just how many there are depends upon the experience and viewpoint of the individual or organization defining them. To FACTORY, the ten that are described in the following paragraphs appear to be the most important.

1 TO MAKE LABOR UNIONS RESPONSIBLE FOR LIVING UP TO CONTRACTS

There is no legal way, under federal labor law and in most states, whereby a union or union leaders can be held responsible for living up to collective bargaining contracts. Managements that have tried to write terms into contracts which would hold unions responsible have been cited for unfair practices by the National Labor Relations Board, which is given extraordinarily broad powers under the Act.

2 TO OBLIGATE UNIONS, AS WELL AS MANAGEMENT, TO BARGAIN

Management must bargain, must make offers in good faith, under terms of the National Labor Relations Act. Unions have no such duty. For example, Lewis never did state his full demands in negotiating with the coal operators last spring. Again, he did not state what he wanted in meeting them and government representatives before the December strike.

3 TO IMPROVE METHODS OF SETTLING DISPUTES SO THAT WORKERS WILL STAY ON THE JOB DURING NEGOTIATION

Strikes should be a last resort if this industrial nation of ours is to prosper. Federal conciliation and mediation could be specified under certain conditions by law. To what extent could legislation specify other actions or procedures that must be followed before a strike becomes legal?

4 TO PROTECT THE INDIVIDUAL RIGHTS OF EMPLOYEES AGAINST THE CLOSED SHOP AND OTHER COERCIVE DEVICES OR ACTIONS ON THE PART OF UNIONS

Coercion of workers by unions is not prevented by the labor laws. Aside from intimidation, the closed shop and its variations which are permitted under the law make it impossible for many workers to follow free choice as to affiliation.

5 TO PREVENT THE ABUSES OF MASS PICKETING

Mass picketing has been accompanied by mob violence and street warfare in many instances. In important cases, leaders in such violence were not employees of the struck plants. There is evidence that mass picketing furnishes opportunity which Communists take advantage of to incite violence. The law recognizes the right of small groups to picket as a means of advertising a dispute, but it does not forbid mass picketing.

6 TO REGULATE THE COLLECTION AND ADMINISTRATION OF FUNDS BY UNIONS

The law does not make it mandatory that funds collected for pensions, health programs, and the like be applied for those purposes only. There is nothing in the law to prevent use of so-called welfare funds for the payment of

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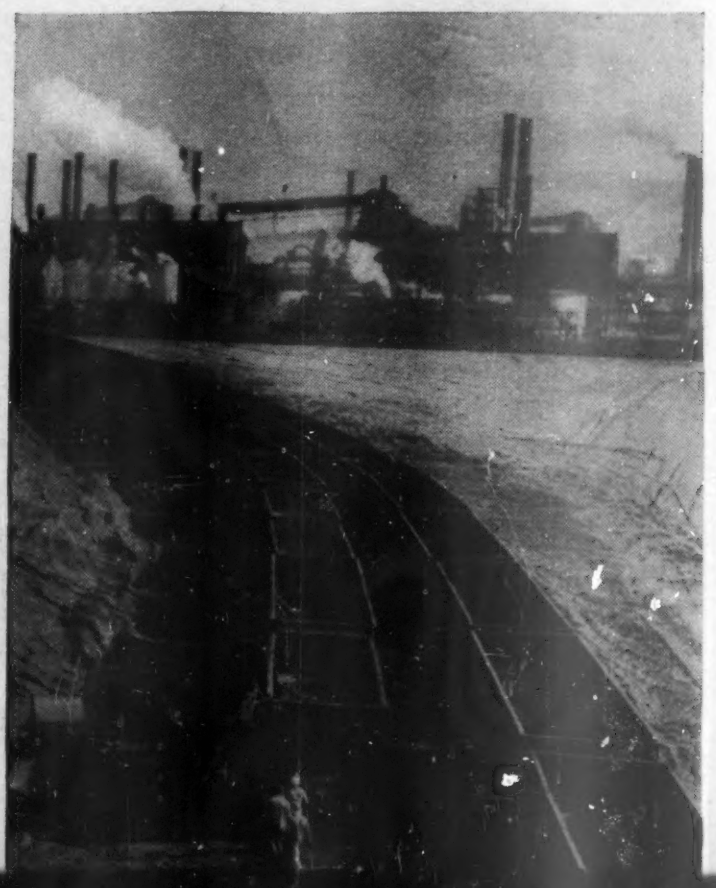

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strike benefits, for the support of sympathetic strikes, and for political activities. Also, under today's laws, unions have no responsibility to account to their members or to the public for general finances. Their treasuries — in some cases — total millions of dollars.

7 TO CLARIFY THE STATUS OF FOREMEN AND SUPERVISORS

Unions repeatedly demand the right to organize foremen. Management says that it should not have to bargain with its own representatives. The National Labor Relations Act leaves the status of supervisory forces in doubt, but the NLRB and the courts have held recently that foremen should have the right to organize under the Act. Unless Congress clarifies the status of supervisors, it may set in motion a revolution in industrial organization.

8 TO AFFORD PROTECTION AGAINST STRIKES THAT IMPERIL THE PUBLIC WELFARE

Under the present labor laws, minority groups have the power to paralyze industry and commerce. As things are now, strikes in the coal, steel, or transportation industries can interfere seriously with the national economy; strikes in public utilities can stop all activities in communities. The recent experiences in connection with the soft-coal industry and the utility strike in Pittsburgh indicate what can happen. Should 140,000,000 people suffer cold, hunger, idleness, at the say-so of any minority group?

9 TO ELIMINATE LOSSES ARISING FROM SYMPATHETIC STRIKES, SECONDARY BOYCOTTS, AND JURISDICTIONAL DISPUTES

Sympathetic strikes, jurisdictional disputes, and secondary boycotts cost the nation heavily in 1946. Rochester, N. Y., and Oakland, Calif., experienced full-scale, general sympathetic strikes. There were losses and delays from jurisdictional disputes. A case of the secondary boycott ruled legal under existing laws by the Supreme Court, was the refusal by members of one union to handle or install many types of equipment not made or wired by their own members in a few small plants. Relaxed during the war, the boycott is now being extended and tightened in many cities.

10 TO PREVENT BROAD LABOR MONOPOLIES

Toughest problem, in many ways, will be the defining and limiting of the broad monopoly powers of unions. Unions are now practically immune from anti-trust laws. NLRB has set "bargaining units" so large in some industries that competing unions are excluded, and industry-wide bargaining — and industry-wide shutdowns — result. A few hundred thousand workers have the economic power to challenge the sovereignty of the government. Or they can make themselves a privileged group with pay and working conditions above average. "Natural" monopolies give utility workers, communications workers, and other small groups control of essential services.

* * *

The causes behind the principal problems have been presented here in great brevity. Before recommendations for the removal of these causes are studied, the existing labor laws should be examined to determine what shortcomings—what omissions and what provisions—constitute those causes.

In the next part of this article are shown the problems as we have defined them; those parts of our labor laws that are most closely related to the problems; the revisions of the labor laws that have been proposed by many sources; and FACTORY's analyses of those proposed revisions.

CONTINUED ON NEXT PAGE

☆ Shortcomings of Present Laws

The Problems	How the Laws Work
1 **To make labor unions responsible for living up to contracts**	• Federal law fails to provide penalties for union violation of contract; liability under state laws varies widely • Anti-injunction laws protect unions in most cases • Strikers can collect unemployment benefits (at state's option) under Social Security Act
2 **To obligate unions, as well as management, to bargain**	• NLRA does not require unions to bargain, but does require employer to bargain, and with NLRB-designated union only • Prohibits injunctions to compel bargaining
3 **To improve methods of settling disputes so that workers will stay on the job during negotiation**	• NLRB investigates, prosecutes, and adjudicates representation disputes on its own initiative; limited appeal to courts possible • NLRB may issue "cease and desist" orders against *employers* it finds guilty of unfair labor practices • Conciliation, mediation, or arbitration possible by mutual consent • Smith-Connally Act requires 30-day notice of intention to strike in "war contract" plants. (Act dies June 30, 1947) • Government may seize struck "war plants," penalize persons interfering with work in such seized plants, but has never done so. (Power to seize ends on March 31, 1947, when Selective Service Act dies) • Presidential fact-finding boards may be appointed, but have no legal power with which to enforce findings
4 **To protect the individual rights of employees against the closed shop and other coercive devices or actions on the part of unions**	• By NLRB interpretation, the majority in designated bargaining group negotiates for all, depriving minorities of representation even to the point of forcing dissenters "into the union or out of a job" • Allows "compulsory unionism" contracts which require a man to join and remain in "good standing" with the union in order to hold his job • Provides no penalties for strikes to coerce workers into joining a union, for mass picketing, or for intimidation • Some states have outlawed the closed and union shop

—Revisions That Have Been Proposed

Proposed Changes	FACTORY's Appraisal
• Require unions to incorporate • Make unions suable in civil courts for contract violations • Cut off NLRA protection of unions and members striking in violation of existing contracts • Allow courts to enjoin contract breach, and attach union funds for damages • Outlaw state unemployment benefits (in so far as they are made possible by the Social Security Act) to workers striking in violation of contracts	Incorporation is an acknowledged device to *limit* individual liability; entire new structure of corporate law would be necessary if unions were to be covered effectively and fairly. Making unions as well as employers civilly liable for contract violations is important if labor and management are to bargain on "common ground." Other proposals would help restore industrial balance, but to be effective would require a prohibition on strikes to recover fines, damages, and other penalties
• Cut off NLRA protection of unions and members of unions refusing to bargain • Cut off NLRA protection of "wildcat" strikers • Allow employer to require NLRB election when certified union refuses to bargain • Declare strikers no longer "employees" under the Act after a specified length of time (30, 60, 90 days, etc.)	"Insurgent locals" and "wildcat strikers" are blamed by unions for much industrial unrest; the first two proposals would provide the unions with the weapon they need to control their membership. The third would give workers an opportunity to express dissatisfaction with a non-bargaining union, if such dissatisfaction was present. The last proposal seems worth while when the union has refused to bargain in good faith.
• Re-define "unfair labor practices," specify unfair practices for unions as well as for management; include as an unfair practice failure to exhaust all peaceful means to settle a dispute before striking • Cut off NLRA protection of unions striking without a strike vote taken at a meeting where the employer has an opportunity to state his position • Require unions and employers to file with Labor Department (or Conciliation Service) copies of all agreements, and advance notice of all proposals for revising or amending agreements • Require compulsory arbitration • Set up a system of labor courts • Terminate power to seize plants • Separate prosecuting and judicial functions of the NLRB	First proposal gets qt crux of problem by insuring that strike is a "last resort." Strike votes on basis of full information from both parties to dispute seems minimum requirement to protect workers' desires. Advance filing of proposed changes in agreements (and of any counter-proposals) would place negotiations on a firm basis, clear the air around the bargaining table. Compulsory arbitration is distasteful to both parties; decisions are seldom accepted in good faith; "third parties" rarely are capable of rendering "correct" decisions because not personally affected. Labor courts are open to same criticism; have recently broken down in Australia under strain of reconversion. Plant seizure is held ineffective by both parties; has usually been a mere cloak for surrender to unions; is dangerous tendency toward nationalization of industry. Separation of powers within NLRB appears necessary if parties are to have a fair trial and stand equal before the law
• Outlaw the closed shop, union shop, and maintenance of membership • Give individuals and minorities option of bargaining independently • Permit the closed shop, but ban the closed union (which has control over admission and expulsion) • Provide governmental supervision and rules for regular union elections	Banning the closed union would too severely limit union control of its own membership, and would be difficult and disagreeable to enforce. Sensible alternative seems to be to outlaw all forms of compulsory unionism. While government supervision of union elections might appear to have some merit, policing job would be almost impossible and would lead to unnecessary friction. With members free to quit mismanaged unions, regulation would probably be self-administered

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☆ Shortcomings of Present Laws

The Problems	How the Laws Work
5 **To prevent the abuses of mass picketing**	• Federal injunctions impossible except to restrain violence, and then only under conditions difficult to meet • Federal and, indirectly, state courts are prohibited from enjoining picketing to accomplish purposes contrary to the intent of the NLRA • Unions are protected from most conspiracy or monopoly charges • Difficult to establish responsibility for picketing abuses • Immunities protect union funds in damage suits and criminal actions
6 **To regulate the collection and administration of union funds**	• No accounting, public or private, of union funds now required by law except in Massachusetts • No restrictions on the use of union funds, except for general limitation on political contributions • Unions may acquire full control of royalties or other taxes on production, as may be provided in collective bargaining contracts
7 **To clarify the status of foremen and supervisors**	• Section 2 (2) of the National Labor Relations Act provides that *The term "employer" includes any person acting in the interest of an employer, directly or indirectly . . .* • Section 2 (3) of the National Labor Relations Act provides that *The term "employee" shall include any employee . . .* **The problem as to which of these two paragraphs covers foremen and supervisors has been variously answered by the NLRB and the lower Courts. It is now before the Supreme Court of the United States, and all pending cases involving the status of "supervisory" employees are awaiting the Court's decision**
8 **To afford protection against strikes that imperil the public welfare**	• Requires 30-day notice of intention to strike in "war contract" plants • Provides for conciliation or mediation by Labor Department; Presidential fact-finding boards are an extension of this service • Government may seize struck "war plants" • Only in the railroad industry is there special machinery that parties are required to exhaust before striking • No penalties for failure to use NLRA procedures to settle organizational or representation disputes • No penalties for "wildcat," "illegal," or contract-violating strikes • Strikers can collect unemployment benefits (at state's option)

—Revisions That Have Been Proposed

Proposed Changes	FACTORY's Appraisal
• Prohibit picketing of a plant by non-employees of that plant • Re-define picketing and permit courts to enjoin violence, coercion, or intimidation • Cut off NLRA protection of unions or union members abusing the right to picket peacefully • Make unions civilly responsible for damage caused by union-authorized pickets	A flat prohibition of non-employee picketing when peaceful and fair seems undesirable; however, some limitation would appear advisable in so far as it acts as a restraint upon *mass* picketing. Unions, employers, and the public alike would benefit from the personal and property protections afforded by the last three proposals
• Require unions to make a public financial accounting at regular intervals • Require unions to incorporate • Place worker-welfare, employee-benefit, and insurance funds under public or joint labor-management trusteeships • Outlaw royalties and other "taxes on production" • Fix union fees and dues by law • Make all union fees, dues, and assessments subject to a general vote of all members	Periodic public accounting would afford a needed protection to members and to the public. Incorporation under existing laws would serve no good purpose. Workers are entitled to the benefits of the broader experience of public or joint administration of welfare or allied funds collected under terms of labor contracts. Only effective means of enforcing a prohibition on royalties would seem to be a flat outlawry of all employer contributions to worker-benefits, an established and accepted practice. There should be some way to prevent exhorbitant fees looking toward creation of monopolies, but government fixing of fees and dues would probably require undue regulation. Requirement that such affairs be subject to vote seems only reasonable
• Amend NLRA to exclude foremen and supervisors from category of "employees" • Bar foremen and supervisors from membership in rank-and-file unions, but permit them to form their own independent unions • Protect seniority and other rights under the Act of any foreman who is demoted to the ranks or resigns his foremanship	Definitely classifying foremen and supervisors as management personnel would eliminate any need for "management bargaining with its own representatives," and the possibility of union retaliation against foremen who discipline fellow-members. If foremen are not exempted, Congress may unwittingly endorse a revolution in industrial organization. However, in cutting off foremen from NLRA jurisdiction, the law must be clear in its definition of "foremen" to prevent possible abuses by industry of this exemption
• Require compulsory arbitration • Set up a system of labor courts • Give present courts jurisdiction in such disputes • Cut off NLRA protection of strikers imperiling the "public welfare" • Ban unionization in "essential" industries • Encourage voluntary arbitration • Outlaw industry-wide bargaining* • Write new anti-monopoly act to include unions* • Apply present anti-trust laws to unions • Conscript strikers when "public welfare" is imperiled • In rate-regulated utilities outlaw strikes, have control commissions fix wages and working conditions* *See Problem 10 on "Union Monopolies"	Compulsory arbitration or labor courts should be last resort, because implications are so far-reaching. Present courts would be too slow. Careful definition is needed if strikers "against public welfare" are to lose NLRA protection. Banning unions an unnecessary extreme. Voluntary arbitration commendable if rules can be agreed upon, but no certainty of protection for public. Outlawing industry-wide bargaining might be difficult to define and enforce, but seems to offer possible solution if accomplished through a new anti-monopoly act. Present anti-trust laws would be difficult to apply. Conscription idea quashed once; still un-American, but presents a challenge to solve problem by less drastic means. Proposal relative to utilities worthy of most careful consideration

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☆ Shortcomings of Present Laws

The Problems	How the Laws Work
9 **To eliminate losses from sympathetic strikes, secondary boycotts, and jurisdictional disputes**	• No provision made in NLRA for handling such problems • These practices cannot be enjoined, and are not subject to proceedings under the anti-trust laws • Union officials may call strikes without a strike vote, except in "war contract" plants, as provided in the Smith-Connally Act • NLRB may be required by the union to take a strike vote, but may not be so required by employers • A union may strike for recognition even though the employer cannot grant it because another union has already been certified by the NLRB
10 **To prevent broad labor monopolies**	• Clayton, Norris-LaGuardia Acts and Supreme Court decisions give unions practical immunity from anti-trust laws — unless union conspires with employers • Lack of definition of "bargaining unit" in NLRA allows NLRB to set such broad boundaries that competition against established union is virtually impossible, with the result that bargaining frequently becomes industry-wide

☆ Portal-to-Portal Pay—Questions and Answers

Many bewildered employers are still asking — and with good reason: *What hit me?* It was just this: *Portal-to-portal pay.* By a new interpretation of a 1938 law, employers suddenly find themselves liable for retroactive damages for failure to compensate for time which no one previously believed to be compensable.

The Supreme Court opened the flood gates last June. The decision in the Mount Clemens (Mich.) Pottery Company case posed — and still poses — a real threat of bankruptcy to a large portion of the manufacturing companies in the country. Most spectacular claim so far is the bill for $270,000,000 the UAW presented to the Ford Motor Company on behalf of workers *at the Rouge plant only.* Total for all industry may well exceed $5,000,000,000.

Employers are also asking, "Just exactly how does this mess affect me?" Even the lawyers are not certain of all the answers. But here are some of the things of which you can be *reasonably* sure, if and when a suit is filed against you for recovery of portal-to-portal pay.

Q. *What is the possible extent of my liability?*
A. You may have to compensate *retroactively* for all previously uncompensated time during which an employee was "required" to be *on your premises,* but with due consideration to the doctrine of *de minimis.* And as penalty, you will have to pay *double* the amount ordinarily due.

Q. *Is there any limit on the retroactivity?*
A. Unless the courts find that state laws provide protection, the retroactivity extends to 1938, when the Fair Labor Standards Act was passed by Congress.

Q. *And what does* de minimis *mean to me?*
A. Nobody really knows. It will be up to the courts to decide what is "negligible" in determining liability.

Q. *Can I settle these claims out of court?*
A. Only for the full value of the claim (including the double damages). It is an established principle of common law that a money claim may not be settled for less than

—Revisions That Have Been Proposed

Proposed Changes	FACTORY's Appraisal
• Cut off NLRA protection of those engaged in sympathetic strikes, secondary boycotts, or jurisdictional disputes • Require NLRB elections on petition of employer • Allow courts to enjoin unions engaged in sympathetic strikes, secondary boycotts, or jurisdictional disputes • Make sympathetic strikes and secondary boycotts subject to anti-trust action • Provide compulsory arbitration in jurisdictional disputes	**Removal of NLRA protection seems to offer the best solution for sympathetic strikes and secondary boycotts; it would not help settle jurisdictional disputes (employer-initiated elections are the answer here). Injunctions should be resorted to only if other measures fail. Application of present anti-trust laws would probably be unwieldy, but might be effective if limited to these two practices. Compulsory arbitration dangerous to our industrial system; should be last resort**
• Allow only 25 per cent of any union's agreements in each industry to terminate in any calendar quarter • Have NLRA state-administered to limit jurisdiction of Boards and unions to state boundaries • Write new anti-monopoly act to include unions • Apply present anti-trust laws • In utilities where rates are state or federally regulated, direct control commissions to fix wages and working conditions to meet prevailing local standards; arbitrate differences as to existing practices	**Large bargaining units mean industry-wide bargaining, almost assure major economic dislocation when strikes come. "Spreading" terminations or placing NLRA control in state hands might solve the problem, but would be unwieldy and would multiply the present problem of knowing "what the law is." Present anti-trust laws would require modification to permit present unions to function; might well result in their total dissolution. New anti-monopoly act to outlaw broader aspects of union monopoly, such as industry-wide bargaining, appears to be the answer. If strikes continue in utilities, outlawing of such strikes under conditions in the proposal should be considered. Compulsory arbitration a dangerous, and last, resort**

full value. In legal language, anything less than full value is not valid "consideration," and even though the claimant [employee] may have signed a waiver of his rights, he may at any future time bring suit to recover the balance due him.

Q. *Can I settle with the union for all my employees?*
A. Technically, no. The union can merely act as agent for the employees. And any individual employee who feels he has received less than his due from this joint action may bring suit for the balance.

Q. *What do these claims mean to business in general?*
A. "What do they mean to the *national economy?*" would not be an exaggeration. Two examples tell the story: (1) The corporations employing 84 per cent of the workers in one industry in New York City, according to court evidence, do not have sufficient net worth to meet the increase in payroll cost. *On the record, they would be bankrupt.* (2) Threatened inheritance taxes of about $200,000,000 shook the Ford empire to its very foundations at the time of Edsel Ford's death. Portal pay claims, which may exceed half a billion dollars, might well wreck even this industrial giant.

That is a pretty black outlook for business. And it is also a pretty dark outlook for workers. Picking up a "free" $1000 or more wouldn't break any worker's heart. But would he be as anxious to get it if he realized that in doing so he might put enough companies out of business to create an unemployment problem worse than the 'thirties?

Q. *What can be done to prevent this catastrophe?*
A. Short of constitutional amendment, no one seems to be certain that any particular method of limiting such "hidden bankruptcy" claims would itself be constitutional.

Some lawyers feel that Congress can deny recovery of anything in the nature of a "windfall," and they argue that portal pay, resulting as it does from a new interpretation, is a windfall. Many others, however, maintain that the right of action given to an employee under the Fair Labor Standards Act is a property right, and as such cannot be modified, restricted, or limited in any way.

Only *certain* relief seems to lie in the Supreme Court reversing and invalidating its Mount Clemens decision.

However, the problem has now reached such proportions that many informed observers believe Congress and the Courts will agree upon the validity of some measure to prevent this national disaster, even if such a move meant avoiding a strict interpretation of legal technicalities.

Of course, Congress could provide *partial* relief in either of two ways: (1) Order a second re-negotiation of war contracts; or (2) provide for tax refunds to adjust for the decreased profits in the affected years.

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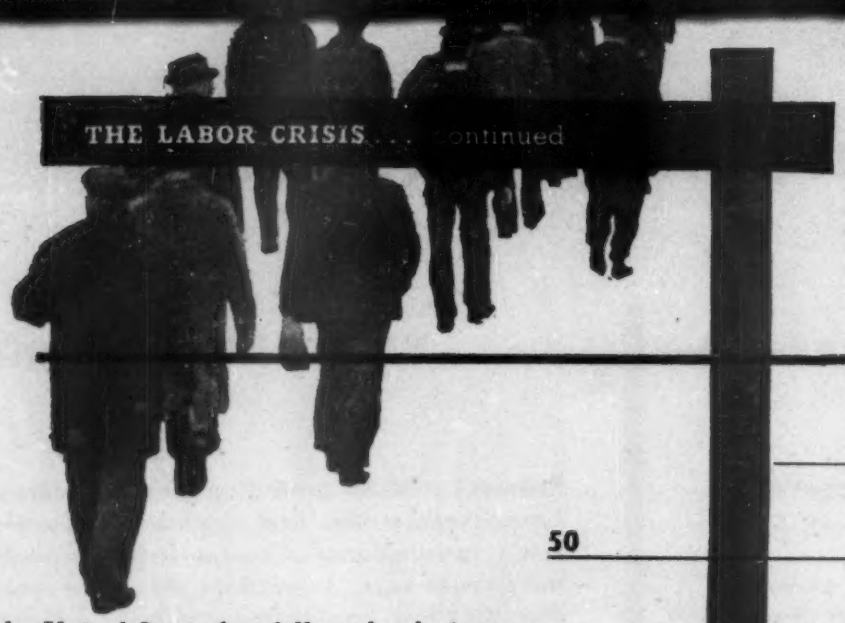


Labor legislation in the United States has followed a devious course for more than a century.

Common law, now largely supplanted by specific statutes, held organized action in support of workers' demands to be illegal on the basis that it applied unfair and almost coercive pressure. It held also that any restraint of trade was basically illegal, and this was applied generally to restraint caused by labor strikes.

Worse yet, from the standpoint of employees, was the common practice of employers to insist that workers agree not to join a labor union and to make such agreement a condition of employment. This type of agreement is still branded by organized labor as the "yellow dog" contract.

The union movement grew, but the attitude of employers and of the law changed slowly. For example, it took more than 30 years after a United States Commission recommended proscription of yellow dog agreements before Congress finally passed a law to protect workers from them.

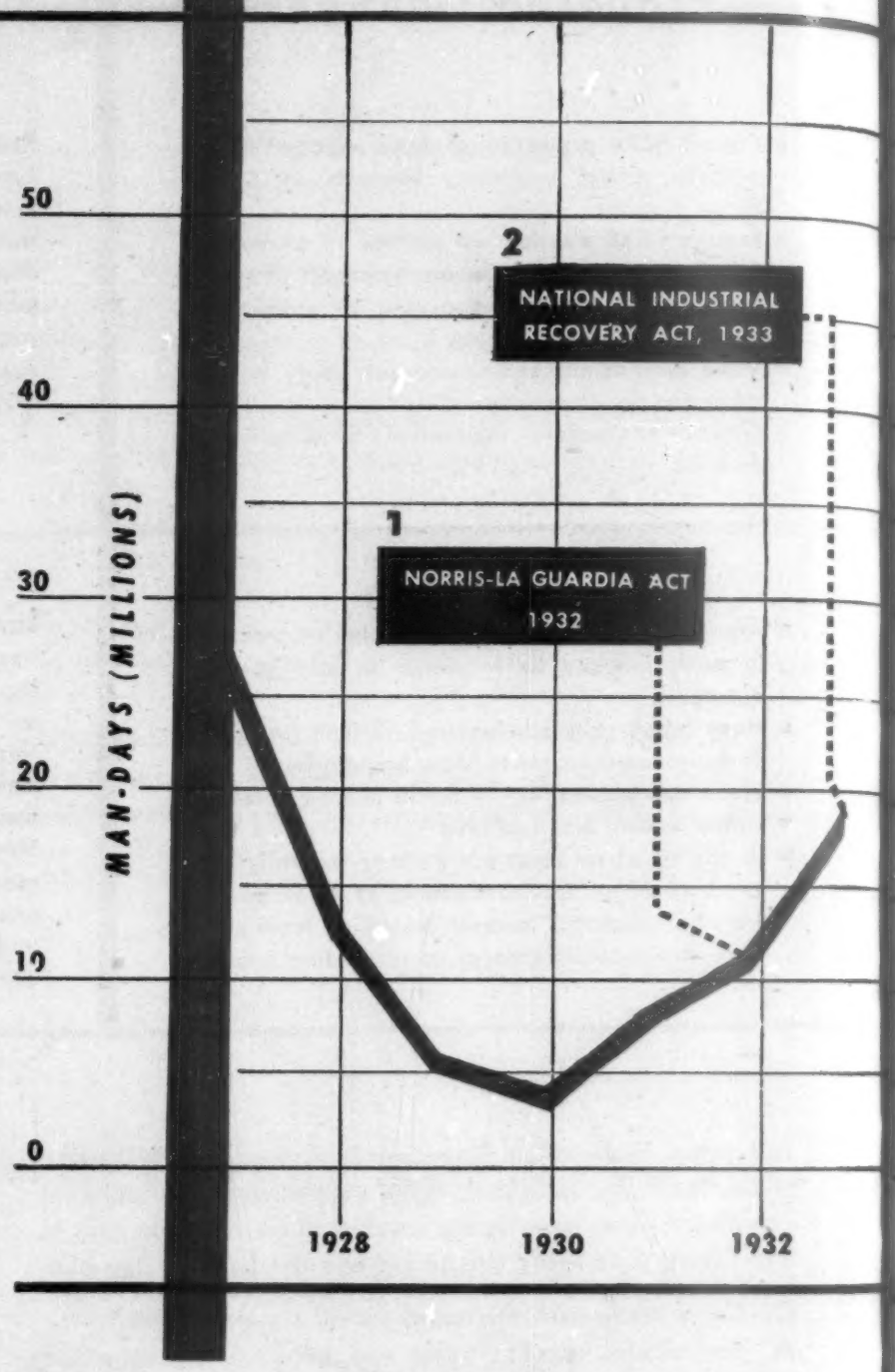
At every stage of union development there was bitter opposition from many employers. Disputes were climaxed with violence — on both sides — and bloodshed. A strike of United Mine Workers that began in 1903 lasted for months and was conducted in most of its phases like a pitched battle. Armed miners exchanged gunfire with company officers and the state militia.

Employers made frequent use of another convenient weapon — *the injunction.* In 1890, the Sherman Anti-Trust Act was adopted in Congress, largely for the purpose of attacking monopolies in trade. It was possible to use this law to enjoin acts of unions that caused a restraint of trade. The Anti-Trust Act made possible a flood of injunctions against strikes and against almost every other form of activity by which the unions sought to grow and to achieve their other objectives.

Under such circumstances, organized labor was severely handicapped. Yet it grew steadily until it reached a point where, backed by public opinion, it was able to persuade Congress to pass the Clayton Act, in 1914, in the intended purpose of exempting unions completely from the Anti-Trust Law. For the most part, the Clayton measure never did what it was intended to do. The same cannot be said of later laws, enacted with the acknowledged intent of being pro-labor. These relatively recent developments in labor legislation are as follows:

1. **NORRIS-LA GUARDIA ACT, 1932,** exempts unions from prosecution under the Anti-Trust Law, and limits federal courts in issuing injunctions against labor unions. It outlaws the yellow dog contract.

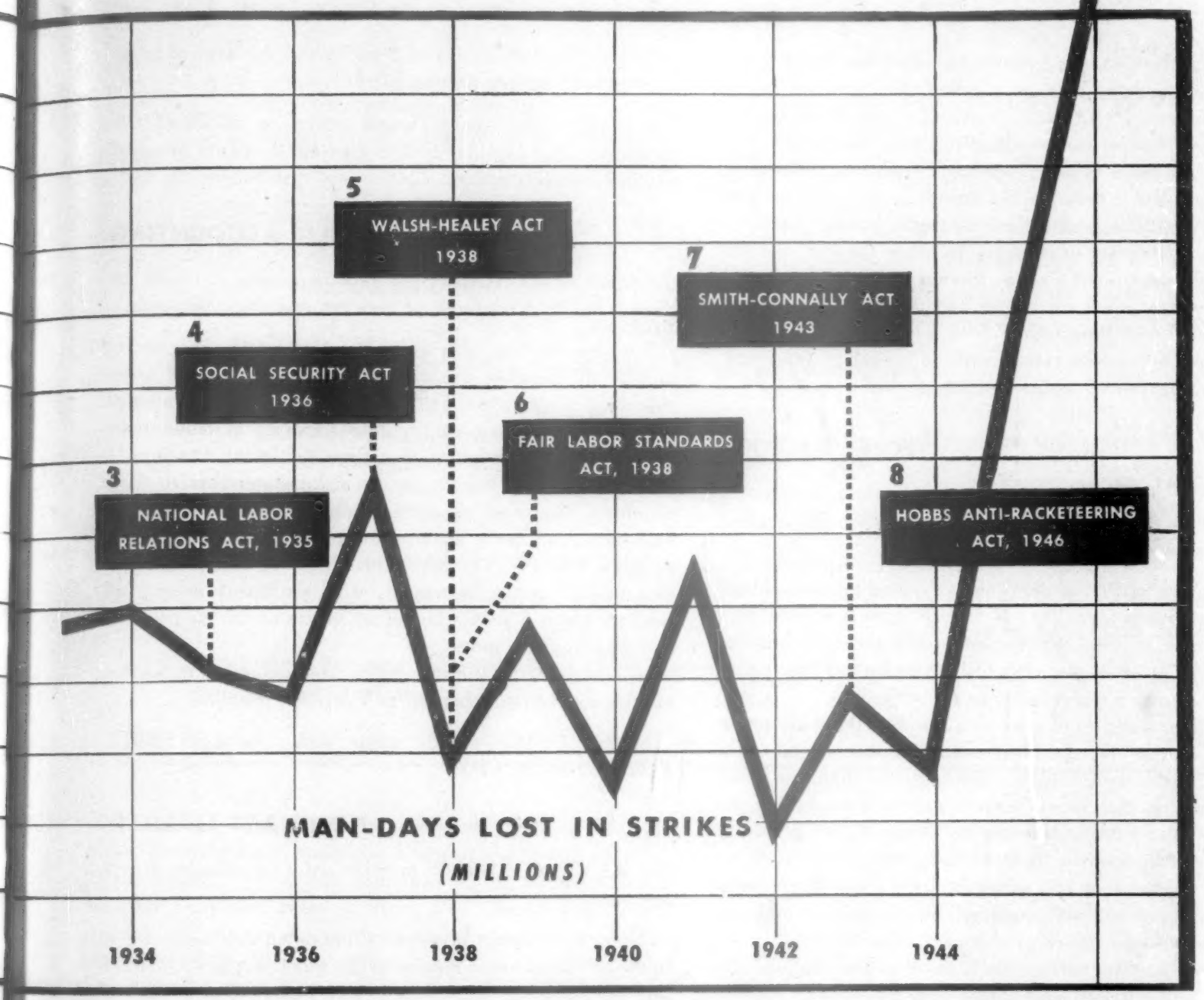
☆ Evolution



2. **NATIONAL INDUSTRIAL RECOVERY ACT, 1933,** provided a general guarantee for all workers of the right to organize. Although the NIRA was found unconstitutional, the right to organize survived in other legislation.

3. **NATIONAL LABOR RELATIONS ACT, 1935,** established the National Labor Relations Board to administer its provisions. Board's two main functions are to prevent employers from engaging in certain unfair labor practices and to determine by elections desire of employees as to who shall represent them in collective bargaining. Unfair labor practices, as defined in the Act, are: Interfering with, restraining, or coercing employees in the exercise of their rights; dominating or interfering with any labor organization; discriminating against members of labor organizations. Employers are forbidden to discharge employees because they file charges or give testimony under the Act. Employers

on of Labor Laws—and Strike Record



cannot refuse to bargain collectively. Act recognizes closed shop by allowing the union with collective bargaining rights to demand that all workers in unit maintain membership as a condition of employment. Act provides for review of Board action by courts, but suspends normal rules of evidence so that Courts accept "facts" as Board finds them and rule only on "law." Act does not specify unfair practices for unions, does not require unions to use its procedures, places no obligations on unions to bargain or be responsible for their contracts.

4. **SOCIAL SECURITY ACT, 1936,** sets up old age and survivor's insurance and unemployment compensation plans. Under some conditions, states allow strikers to collect unemployment compensation.

5. **WALSH-HEALEY ACT, 1938,** provides that employers with government contracts must meet basic standards of an eight-hour day, overtime, compliance with state health and safety laws, and the wages prevailing in the community.

6. **FAIR LABOR STANDARDS ACT, 1938,** establishes 40-cent minimum hourly rate, the 40-hour week, and overtime rates.

7. **SMITH-CONNALLY ACT, 1943** (expires June 30, 1947) applies only to "war plants," requires unions to file 30-day strike notice, limits union political activity, and provides penalties for persons engaged in illegal work stoppages in plants seized under the Selective Service Act (now slated to die on March 31, 1947). Under this Act, strike notices have become a formality issued 30 days before contracts expire, and the possible penalties have never been invoked.

8. **HOBBS ANTI-RACKETEERING ACT, 1946,** amends 1934 act to bring unions under its provisions. Makes it a felony to interfere by robbery or extortion or by threats of violence with movement of goods in interstate commerce.

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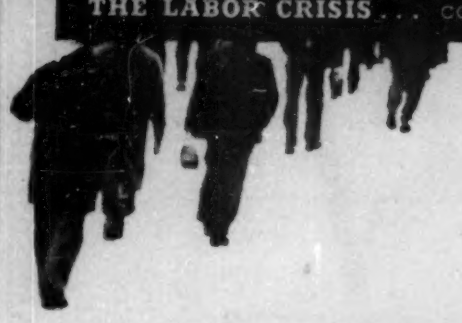


☆ What Factory Workers Want

What do *workers* want in terms of specific labor legislation?

Few workers have ever been asked that question in organized surveys. FACTORY's survey in July, 1946, on the proposals contained in the Case Bill was one of the few opportunities workers have ever had to express themselves directly on labor legislation. Because it is so nearly unique, that survey will be summarized on the following pages.

But there is plenty of evidence in other surveys on what workers like and dislike about the current labor picture — things they feel need correction and, in some cases, what type of correction they want.

Based on 64 surveys made over a period of 10 years, here's what the *worker* wants Congress to do:

SECRET BALLOTS

HE WANTS CONGRESS *to guarantee union members a secret ballot for strike votes — and possibly for regular union elections.*

As long ago as 1937 workers were demanding these things by votes of better than 10 to 1. Several surveys covered this subject again in 1944, with substantially the same results. FACTORY found 84 per cent of both union and non-union workers favoring a secret ballot before strikes.

Two other polls that year dealt indirectly with union elections, and produced an interesting commentary on workers' experiences with WLB elections. Better than four-fifths of workers felt that union leaders were not respecting the wishes of the rank-and-file, were running things pretty much to suit themselves. But only a bare majority of workers voted in favor of the secret ballot for union elections when that proposal was qualified by stipulating that the election should be under government supervision.

Last year saw no further polls on elections, but the demand for secret ballot votes before strikes rose to an all-time high, close to 30 to 1.

Summary: The worker wants *action* on *BALLOTS.*

MEDIATION AND COOLING-OFF

HE WANTS CONGRESS *to set up federal mediation boards to operate during a mandatory cooling-off period.*

FACTORY first asked this question in connection with its survey of worker opinion on proposed legislation in July, 1946. At that time, two questions were asked: "60-day cooling-off period . . . to be used in an effort to settle the controversy?" Union and non-union workers favored it overwhelmingly, by 75 and 85 per cent, respectively. The second question was "a federal mediation board to step in . . . for 30 days while seeking to adjust differences?" Here the demand was even more urgent, 84 per cent of union members and 89 per cent of non-union workers. Two other surveys made during 1946 brought substantially the same results — vote ratios of 3 and 4 to 1 in favor of these or essentially similar proposals.

Summary: The worker wants *action* on *MEDIATION BOARDS AND COOLING-OFF PERIODS.* (This proposal was included in the Case Bill.)

PUBLIC ACCOUNTING

HE WANTS CONGRESS *to require unions to make an annual public accounting of receipts and disbursements.*

The demand for such a requirement has been growing rapidly in the past decade, and today has reached overwhelming proportions. Ten years ago union members voted 2 to 1 *against* requiring public financial statements by unions. However, even at that time sentiment was 4 to 1 in favor of requiring unions to make statements *to their members.* The seven years that followed saw members getting more and more anxious for public accounting, until, in 1944, FACTORY found 74 per cent of union members demanding such a statement, with sentiment among all workers about 5 points higher by virtue of the 85 per cent vote of non-union men.

By last year the worker's voice had become even louder, and he voted better than 10 to 1 for this proposal.

Summary: The worker wants *action* on *CONTRACT FOR UNION FUNDS.*

CONTRACT LIABILITY

HE WANTS CONGRESS *to make unions suable for breach of contract.*

There is no doubt in workers' minds on this subject — or in the minds of union members. Six months ago, FACTORY put the question point blank and found 73 per cent of workers voting *for* the proposal. There was no significant difference of opinion between union and non-union men; they voted 72 and 74 per cent, respectively. And a lot of workers were undecided; only 14 per cent came up with a perfectly flat *no!*

Summary: The works wants *action* on *CONTRACT LIABILITY.* (This proposal was included in the Case Bill.)

COMPULSORY UNIONISM

HE WANTS CONGRESS *to guarantee his right to get and hold a job regardless of union membership.*

The first point to recognize here is that the worker is confused — badly confused — about such terms as the *closed shop* and the *union shop.*

Pollsters have been keenly aware of the significance of this issue, and the questions relating to it have been asked many times — and in many ways. Most often, surveys have

in Labor Legislation

Here's what 64 polls showed:

1. A sharp to violent demand for three classes of legislation:

(a) Guarantee union members a secret ballot for strike votes	*Union members only* — **84%**	**YES**
(b) Set up federal mediation boards to operate during a mandatory cooling-off period	*All workers* — **80%**	**YES**
(c) Require a public accounting of union funds	*Union members only* — **74%**	**YES**

2. Workers favor these proposals by 2 or 3 to 1:

(a) Make unions suable for contract violations	*Union members only* — **72%**	**YES**
(b) Outlaw the closed and union shop	*Union members only* — **70%**	**YES**
(c) Outlaw mass picketing	*Union members only* — **66%**	**YES**
(d) Drop the barriers to "free speech" by management	*Union members only* — **62%**	**YES**

3. Workers are of two minds about these things, but a majority or close to it would:

(a) Outlaw secondary boycotts	*Union members only* — **53%**	**YES**
(b) Provide severe penalties for strikes against the government and government-seized plants	*All workers* — **49%**	**YES**
(c) Outlaw political activity by unions	*Union members only* — **43%**	**YES**

4. Workers and foremen are at odds on one very important issue:

(a) Prohibit unionization of foremen	*Foremen only* — **64%**	**YES**
	Workers only — **52%**	**NO**

5. And workers are outspoken in their *opposition* to this suggested legislation:

(a) Prohibit union-controlled worker-welfare funds	*All workers* — **63%**	**NO**

offered the worker a three-way choice: "Which do you favor, the open shop, the union shop, or the closed shop?" That question, or one very similar to it, has been asked of workers every year save one since 1941. Analysis of those surveys presents two definite trends. A trend *toward* the open shop, and a trend *away* from the closed shop. Six years ago, about 3 out of every 10 workers favored the open shop; today about 6 out of 10 favor it, and the increase has been steady. Six years ago, about 2 out of every 10 workers favored the closed shop; today only about 1 out of 20 favors it; and the decline — to one-fourth its previous strength — has been steady. More or less "in the middle" of these shifting trends has been the union shop; it has held favor with between 40 and 60 per cent of the workers throughout the period.

But here is where the lack of understanding of terms enters the picture. When asked if a man should be required to remain in a union to hold his job — the backbone of the union or closed shop — union members shout their opposition to the tune of almost 3 to 1. And non-union workers oppose this policy by well *over* 3 to 1.

Further evidence of workers' dissatisfaction with compulsory union membership was turned up by FACTORY in October, 1944. The question was this: "Do you believe a man joins a union because he wants to, or because the union compels him to?" It was no surprise when only 36 per cent of non-union workers said it was because he wants to. But among union members themselves, only a bare majority — 56 per cent — said that men join unions because they want to. And while 8 per cent were undecided, *34 per cent of union members frankly admitted that union membership is a matter not of desire but of compulsion.*

Summary: The worker wants *action* on *COMPULSORY UNION MEMBERSHIP.*

MASS PICKETING

HE WANTS CONGRESS *to protect him from violence and coercion in the exercise of his individual right to work.*

In other words, he wants Congress to outlaw mass picketing — and the violence that is almost certain to accompany it.

FACTORY asked this question last summer: "Do you think a striker who uses violence while picketing should lose his protection under the Wagner Act?" Workers said *yes* by 3 to 1; even union members went for this change by well over 2 to 1.

But even the 2 or 3 to 1 ratio doesn't tell the whole story. Any question calling for loss of Wagner Act protection is almost certain of defeat. Time and again, workers will support a proposal on one poll, only to turn it down on another when a provision calling for loss of Wagner Act

Acme

protection is included. This question on violence while picketing is the sole exception FACTORY was able to find in over 200 polls.

Summary: The worker wants *action* on *MASS PICKETING.* (This proposal was included in the original Case Bill, but was removed before the bill went to the President.)

EMPLOYER FREEDOM

HE WANTS CONGRESS *to drop the present legal barriers to freedom of expression on the part of management.*

No trick questions have been used here to obtain worker endorsement of the vague constitutionality of "free speech." Every one of the polls studied included the phrase "about joining unions," "about union matters," or some equivalent. Some even called attention to the fact that this practice is now prohibited by the Wagner Act. These polls, made over a period of the last four years, have shown remarkable consistency of results. Non-union men favor the proposal by 4 to 1 and better; union members have shown from a slight majority to 2 to 1 in favor. One recent survey found three-fifths of union members in favor of letting a management representative state the company's case *in union strike meetings.* While the union vote is not overwhelming. *all* workers are almost 3 to 1 in favor.

Summary: The worker wants *action* on *FREE SPEECH FOR MANAGEMENT.*

BOYCOTTS

HE WANTS CONGRESS *to protect him from loss of work resulting from secondary boycotts.*

FACTORY asked: "If you had your say, would you ask members of your union to refuse to handle or install parts made by non-union workers or members of another union?" Of all workers, only 1 out of 5 said *yes.* And here is how the figures (percentage of "yes" votes) broke down by union affiliation — CIO members, 31; AFL members, 24; independent union members, 12; non-union workers, 10. In other words, except for members of the two giant unions, only about 1 worker in 10 favors secondary boycotts.

Only reason such a lack of favor does not place secondary boycotts in a class with those items on which the worker is violent in his demand for action is that nearly a quarter of all workers failed to express *any* opinion on the question, with the result that only 55 per cent of workers came out with a flat *no* on this proposal. However, that 55 per cent included absolute majorities of both union and non-union men, with 53 and 60 per cent, respectively.

Summary: The worker wants *action* on *SECONDARY BOYCOTTS.*

POLITICAL ACTIVITY

HE WANTS CONGRESS *to regulate — and perhaps ban — political activity on the part of unions.*

Most thorough-going survey on this subject was made by FACTORY in the fall of 1945. Workers were asked to choose among: (1) Form own political parties; (2) work with present parties through union committees; (3) stay out of politics. About 10 per cent failed to express any opinion, but, among those who did answer, union politicking came out second best. More workers said "stay out" (47 per cent) than favored the other proposals combined.

Members of the politically minded CIO led the parade in asking for political action, but by a surprisingly small margin. Only 14 per cent want labor to form its own party, while 37 per cent give implied endorsement to the CIO's Political Action Committee by advocating that unions work with present parties. But both of these minorities are overshadowed by the 43 per cent who say flatly, "Stay out."

Further evidence of the distaste for union political activity came last fall from the CIO itself. Thirty-seven per cent of CIO members said they favored unions working with political parties through committees, but less than 5 per cent of them were willing to back up that conviction by donating a single dollar to the CIO-PAC.

Summary: The worker wants *action* on *UNION POLITICAL ACTIVITY.*

STRIKES AGAINST U.S.

HE WANTS CONGRESS *to provide severe penalties for strikes against the Government and Government-seized industries and plants.*

But he is not at all keen about losing his personal protection for violation of law prohibiting such strikes.

He favors rather strongly two methods of enforcing such a law — that do not affect him personally. He votes almost 5 to 3, with 15 per cent expressing "no opinion," to "fine or imprison labor leaders who interfere with resumption of work in plants taken over by the Government." And FACTORY found, too, that he favors by better than 2 to 1 a proposal to give courts "the authority to issue injunctions against union leaders who interfere with the operation of plants taken over by the Government."

It is quite a different matter, however, when it comes to putting his own head on the chopping block. Last summer, FACTORY asked if "workers should lose their seniority rights for refusing to work in plants taken over by the Government." FACTORY was told *no!* Union members were better than 2 to 1 *against* this proposal. Non-union

workers voted 45 per cent in favor, 42 per cent opposed, with 13 per cent unable to decide.

BUT — and it is a large *but* — despite his general approval of measures to enforce seizure once it has taken place, the worker does not approve of seizure itself as a method of settling disputes. Several polls have shown from a bare majority to two-thirds of workers opposed to seizure as a means of settling or preventing strikes.

It is difficult to draw any hard and fast conclusions from such apparently contradictory facts, but it probably adds up to this: the worker wants Congress to put a damper on seizures, limit them to situations threatening *immediate national catastrophe,* and then back up those seizures with plenty of teeth.

Summary: The worker wants *action* on *STRIKES AGAINST THE GOVERNMENT.*

STATUS OF FOREMEN

HE WANTS CONGRESS *to permit the unionization of foremen under the Wagner Act.*

A slight majority — 52 per cent — of both union and non-union men disagreed with the Case Bill provision that would have prohibited foremen joining *workers'* unions. And two-thirds of the workers said *no* to the Case Bill provision that would have outlawed *foremen's* unions.

BUT *FOREMEN* WANT CONGRESS *to make it illegal for foremen to join a union.*

A nation-wide survey of foremen asked point-blank if it was "proper" for a foreman to belong to a union, and very nearly two-thirds came back with the answer that *it is not.* Looked at another way, barely more than a third of the foremen themselves think it is proper for them to join any union at all.

Further evidence that foremen don't believe they should join unions — certainly not workers' unions — is found in a recent poll of foremen in the state of Pennsylvania. A whopping majority of foremen say they consider themselves strictly a part of management. Opposed to this 69.5 per cent is a mere 14.8 per cent who feel that they are more closely associated with the worker.

Faced with this difference of opinion of foremen and workers, how should Congress act? The nation as a whole provides a clue, but even the general public is by no means certain in its own mind. Almost a third of the nation is undecided on unionization of foremen. That is enough to change completely the 4 to 3 ratio now recorded in opposition to foremen joining a union.

Summary: Congress lacks a clear mandate on this issue, but those most intimately affected — the foremen themselves — want *action* to *OUTLAW UNIONIZATION OF FOREMEN.* (This proposal was in the Case Bill.)

WELFARE FUNDS

HE *DOES NOT* WANT CONGRESS *to prohibit union "welfare" funds.*

There were only two sections of the Case Bill that did not have the worker's unqualified approval. The prohibition on union-controlled welfare funds was one of them.

Here is how FACTORY asked the question: "Should employers be prohibited from contributing to worker-welfare funds which are controlled exclusively by unions?" The worker gave Congress a fairly sharp rap on the knuckles for having included that one in the Case Bill. He voted *no* by nearly 3 to 1; only 23 per cent of workers supported this proposal, with a resounding 63 per cent in opposition. The remaining 14 per cent who were undecided certainly could not alter the obvious conclusion.

Apart from the conclusion itself, perhaps the fact of greatest significance in the answers to this particular question was the *lack* of any noticeable difference between the opinions of union and non-union workers. On *no* answers the split was 22 and 25 per cent; on *yes* answers it was 66 and 57. In other words, on this question Congress wasn't bucking a *union* tide, it was bucking a *worker* tide.

The fact that must not be missed is that this question of welfare funds is just one more indication of the worker's insistence upon "security." And if he does not feel he is getting it from management, he will try to get it through the unions, even at the apparently recognized risk of "no public accountability."

Summary: The worker wants *endorsement* of *WELFARE FUNDS.* (The proposal to prohibit employers from contributing to such funds was included in the Case Bill.)

PHRASES VERSUS FACTS

Perhaps the single most important fact to appear in FACTORY's analysis of worker polls is the "selling" job unions have done in gaining worker acceptance of certain words and catch phrases. Workers favor a *term,* but in many cases they oppose the *fact* which it implies. Lesson for management: *Bring home to workers the true meaning and full implications of such terms as secondary boycott, sympathy strike, general strike, contract liability, union shop,* and *closed shop.*

Prime example is the closed shop. Given a three-way choice — open, union, or closed shop — *union members* now split about 40-50-10 in favoring these types of employment. But when faced with subscribing to the principle that a man should be forced to stay in a union to keep his job, *the same group* voices its opposition by a 3 to 1 majority.

What do these two facts mean? Just this—The worker may have been sold on the catch phrase that to outlaw the closed shop would—in the propagandists' term—"emasculate" the Wagner Act. But the worker admits that he doesn't know what he is buying when he cries out against the very things the closed and union shop stand for. He likes the phrase, *but he doesn't like the fact.*

CONTINUED ON NEXT PAGE

☆ What Management and Labor Leaders Say Should Be Done

The comments on the following pages, unless otherwise noted, were prepared especially for FACTORY in response to the following telegram:

"Anxious to report how labor and industrial leaders feel about proposals to promote industrial peace and minimize work stoppages. Congress will likely consider these things—outlaw compulsory unionism, mass picketing, secondary boycotts, sympathetic and jurisdictional strikes. Also providing for labor courts or compulsory arbitration, applying anti-trust laws to unions, and making unions civilly liable for contract violations. Comments of opinion leaders essential if Congressional moves are to be in direction of genuine public interest. Will you discuss briefly these and your alternative proposals for improving industrial relations?"

What Management Leaders Say

CHARLES P. McCORMICK, President
McCormick & Company, Baltimore

The fundamental precept of all peace is faith in each other . . . Faith cannot exist if there is inequality anywhere . . .

Review the laws now on our books, and correct those that do not give equal authority and representation to all concerned . . . First step in the passage of any law should be to decide if the law discriminates . . . Coercion, punishment, and all the rest will only make [labor] a bitter enemy . . .

It is not up to the government to be a master, but to be what it should: *a just judge on all matters and a neutral in all cases, and a prosecutor for those who would like to oppress through their power.*

America is too big, and democracy is too fine an institution, to be shaken by individualists who would rock the entire system for more [illegible] or for greed.

C. E. SWARTZBAUGH, President
Swartzbaugh Manufacturing Company, Toledo

It is my experience that there is no such animal as "collective bargaining."

Under existing laws, directives, and NLRB interpretations, that which most people call "collective bargaining" is more nearly "collective bludgeoning"—the old blackjack and shotgun psychology of compulsion.

In my opinion, Congress should do those things necessary to require organized labor to be as responsible for its acts, morally, legally, and financially, as business and industry must be.

H. W. PRENTIS, JR., President
Armstrong Cork Company, Lancaster, Pa.

Enactment of fair labor legislation by itself will not completely solve the problem, but . . . industrial peace cannot be restored without correcting our present lopsided laws . . .

Employees should be free to join a union, maintain their membership, or resign, as they see fit. All forms of so-called union security are based on coercion of employees and should be outlawed.

Mass picketing, sympathy strikes, jurisdictional strikes, and secondary boycotts should all be prohibited. It should be possible for employees not in sympathy with a strike to remain at work . . .

The anti-trust laws should be modified . . . and applied to labor unions . . .

Unions should be required to bargain in good faith and be held legally responsible for their contracts.

G. F. GAMBER, Director of Industrial Relations
Crosley Division, The Aviation Corporation
Cincinnati

I do not propose legislation to put us back where we were prior to 1933, but I do definitely feel that our labor laws should be amended so that labor and management may stand equal before the law . . . I favor:

1. Legislation outlawing mass picketing with its accompanying violence, so that employees who desire to work may be free to work without threat of injury or injury itself . . .
2. Legislation prohibiting coercion, threats, or strikes to force employees to join a union . . .
3. Legislation prohibiting secondary boycotts, sympathy and jurisdictional strikes . . . as no dispute exists between employer and employees, and the employer is helpless . . .

Labor courts are not the answer to industrial peace, as they are nothing more than compulsory arbitration . . .

Legislation should be passed, if necessary, to have our highest courts hold labor organizations liable under the anti-trust laws . . .

Enable employers to sue a labor organization as an entity for violations of their contract.

JAMES F. LINCOLN, President
Lincoln Electric Company, Cleveland

There is no doubt of the iniquity of the present Wagner Act. It has undoubtedly promoted industrial warfare, as the strike record shows, but changing this law or passing other laws will never eliminate industrial strife. The whole conception of controlling this matter by law is to set up two warring camps...

War never settled anything except the incompetence of leadership.

Labor and management are two groups in manufacturing whose purpose is to cooperate to produce at a lower and lower price so their boss, which is the consumer, will get a better and better service...

The road to industrial peace is clear. The only difficulty is our indecision and incompetence in traveling that road.

DON G. MITCHELL, President
Sylvania Electric Products, Inc., New York

Hope that 80th Congress will not make the mistake... of swinging widely to the right and concocting hasty and radically anti-labor legislation.

It *is* my hope Congress will:

1. Realize that the American people will not stand for any group attempting to force its selfish will upon the country... whether that group be of labor, of business, or of government.

2. Enact legislation that would... assure management and labor equal rights before the law; require of both equal responsibility for their acts; confine government's role to its rightful position of fair and impartial arbiter.

JAY C. HORMEL, President
Geo. A. Hormel & Company, Austin, Minn.

Just as I believe that the too liberal labor legislation resulted from previous abuses against labor, so I fear that certain current abuses by labor may result in extreme remedies...

Jurisdictional strikes should be prohibited, and so should strikes which exceed some certain measure of affecting public interest. Except for such purposes, I am opposed to compulsory arbitration.

As for mass picketing, most strikes would fail if picketing were restricted to the degree which is suggested by the "freedom of speech" rationalization of the idea of picketing...

As for the closed shop, secondary boycotts, sympathy strikes, applying anti-trust laws to unions, and making unions civilly liable for contract violations, the problem is to find the most moderate procedures which would be adequately effective.

JAMES TANHAM, Vice-President
The Texas Company, New York

Compulsory unionism, mass picketing, secondary boycotts, sympathetic and jurisdictional strikes, run contrary to the achievement of these goals [of equality, responsibility, and protection of the public].

Labor courts require a body of law which does not exist and... are not a present answer.

Compulsory arbitration of issues, as distinguished from contract grievances, runs contrary to the idea of free collective bargaining...

The public interest would be promoted by the prevention of monopolies in labor... Uniform application of anti-trust laws would promote equality in law.

Enforceable responsibility for contracts... would promote labor peace by curtailing wildcat and other irresponsible strikes.

We cannot have harmony in a ball game where one side gets four strikes.

What Labor Leaders Say

ALVANLEY JOHNSTON, Grand Chief Engineer
Brotherhood of Locomotive Engineers

Our national legislative committee determines policies, but you can rest assured that our Brotherhood will do what they can to protect the interests of labor.

DANIEL J. TOBIN, General President
International Brotherhood of Teamsters, Chauffeurs, Warehousemen & Helpers – AFL

I was in England during the general strike in 1926... All the other workers in several trades made the mistake of going out on strike in sympathy with the miners.

Shortly afterward, extreme anti-labor legislation was enacted by the British Parliament. The answer to that today is that the Labor Party controls the British Parliament...

Instead of attempts being made by legislative bodies to shackle labor, an attempt should be made—and I think it

is being made—to bring about closer relations with employers...

There are certain vital industries in which frequent strikes cannot be afforded, but the answer does not lie in punitive legislation.

JAMES B. CAREY, Secretary-Treasurer
Congress of Industrial Organizations

The only treatment that will succeed in a democratic society is industrial justice arrived at through collective bargaining in good faith...

For that reason, the Congress of Industrial Organizations rejects the concept of an industrial peace charted by statutory mandate, backed by police force and court injunction. That sort of peace belies its name. It is not peace at all—it is legalized tyranny...

Those who prate of industrial peace might well consider the causes of industrial conflict, rather than jog about like so many quack doctors, treating the symptoms with patent medicines. The causes, not the symptoms, must be treated.

A. F. WHITNEY, President
Brotherhood of Railroad Trainmen

Closed shop and mass picketing are techniques employed to protect gains of organized labor... Any attack on them can be construed only as attack on the fundamental well-being of the people...

Compulsory arbitration is a step toward fascism...

Jurisdictional strikes are not desirable, but legislation is no answer. Both Railway Labor Act and Wagner Act provide for determining labor representation. Focus attention on making these laws work...

Legislation is not the answer to any problems involved in industrial peace, and efforts of government should be thrown behind attempts to make collective bargaining work.

FRANK P. FENTON, Director of Organization
American Federation of Labor

Proposals to invoke industrial peace... should be voluntary in character. The best insurance is the use of collective bargaining agreements, which, if genuine, include a cooling-off period, grievance machinery, and mutual arbitration.

To outlaw compulsory unionism would tend to weaken the responsibility of the union to keep its pledge...

Labor has set up machinery which has greatly minimized strikes of this [jurisdictional] type...

The Clayton Act [which largely exempts unions from the anti-trust laws] should stand as it is.

Labor unions have been held civilly liable for contract violations, but business apparently has been free from penalty for its many violations of union contracts.

HARRY BRIDGES, President, International
Longshoremen's and Warehousemen's Union—CIO

(In an address to the California State CIO Convention)

There is no use trying to tell workers about Congress rolling back prices. We don't expect that kind of Congress. We expect that they will do everything they can do to reduce wages and will try to accomplish that purpose by destroying unions.

WILLIAM GREEN, President
American Federation of Labor

(In a letter to AFL membership)

I greatly fear attempts will be made... to enact further objectionable legislation similar to the notorious Case Bill...

Unfortunately a large number of Congressmen who voted in favor of passage of the Case Bill were re-elected with increasing majorities... They will accept their elections as a vindication of their action...

If they vote for anti-labor legislation, they cannot expect the support of labor in the event they are candidates for re-election to Congress.

PHILIP MURRAY, President
Congress of Industrial Organizations

Constant repetition of demands for repressive anti-labor legislation, in corporate management circles or in the press, does not prove the necessity of such legislative action. The most frequently voiced proposals shoot far wide of the mark of promoting industrial peace and minimizing either strikes or lockouts.

I feel that the proposals included in the Case Bill, the suggested Ball Bill, the earlier Ball-Burton-Hatch Bill and a variety of suggested amendments to the Wagner Act, were framed not with the idea of achieving industrial peace but with the hope of placing vindictive penalties upon organized labor because of its dramatic gains in the past decade.

☆ What Congress Is Likely to Do

As this report is written, there are no specific bills that have been made public. Nor are there indications that any have been agreed upon by the Senators and Congressmen who will lead the way in labor legislation. This statement of what Congress is likely to do, therefore, consists of a report of what these leaders are thinking and planning, and the extensive proposals that will be considered, together with FACTORY's interpretation of the results that are most likely to be forthcoming

A consciousness for the "public interest"—making it paramount, above the interests of either party to a labor dispute—has permeated Congressional thinking because of strikes in the past year. This feeling is reflected in the many proposals for new labor legislation now being debated.

Sifting through them, we find they point to one broad objective: *To protect this country against the ravages of crippling strikes in public utilities and other essential industries, particularly coal, steel, and transportation; to make it impossible, ever again, for one union or one man to take a strangle hold on the country.*

ESSENTIAL INDUSTRIES

To achieve the prevention of crippling strikes in essential industries, the Congressional planners would establish new machinery for settling labor disputes. At the same time, they would try to equalize the bargaining powers which in the 11 years of the National Labor Relations Act have tilted the balance from the management to the union side.

Under these conditions, it is natural that the changes under consideration weigh heavily against labor. But not all of them. Management shuns compulsory arbitration and labor courts as much as, if not more than, organized labor. Only with reluctance will either management or labor accept the creation of a new labor board which, like the War Labor Board, would short-circuit free collective bargaining. Congress is not likely to provide for a procedure that neither management nor labor wants.

ARBITRATION AND LABOR COURTS

Compulsory arbitration and labor courts, if provided, would be very restricted, on the ground that government fixing of wage rates would inevitably result in price-and-profit regulation. It is inconceivable that a Congress elected by a people who "had enough" of wartime shackles would go further in regulating labor disputes than was attempted even during the war.

Compulsory settlements may be required in a few public utilities whose rates and earnings are already fixed, but this will not be applied generally. For the present, at least, there is not much support for labor courts—which have not solved Australia's strike problems.

Prospects are good that Congress, in attempting to promote the peaceful settling of disputes, will consider the need for permanent mediation machinery paramount. If so, it will provide for a mediation board along the lines of that contained in the Case Bill—opposition of labor, industry, and the Administration notwithstanding. On an issue like this, a Truman veto would be overridden.

WAGNER ACT CHANGES

The 80th Congress can be expected to enact, with a minimum of discussion, those measures intended to balance the bargaining powers which were in the Case Bill. Some involve changes in the Wagner Act or its interpretation, some don't. They include the denial of Wagner Act protection to foremen, making unions suable in court for breach of contract, bringing unions within the purview of the anti-trust laws, and banning secondary boycotts.

Some other changes in Wagner Act rules, not touched by the Case Bill, are in prospect through either legislation or a change in administration policy. Included are greater freedom of speech, short of intimidation or coercion, for employers during union organizing drives; also the right of an employer to petition for an election whenever two unions are seeking to represent his workers and he is threatened with a strike over the question of union recognition, and possibly under a few other conditions, such as at the expiration of a contract. Except from labor, these proposals have little opposition and can be handled by Congress with little difficulty.

JURISDICTIONAL STRIKES

Congress will impose some limitations on the right to strike. Jurisdictional strikes, for which even union leaders admit there is no justification; strikes in public utilities; and stoppages while a mediation or emergency board is functioning in a dispute, are most likely to be stopped. Industry-wide shutdowns also will get considerable attention.

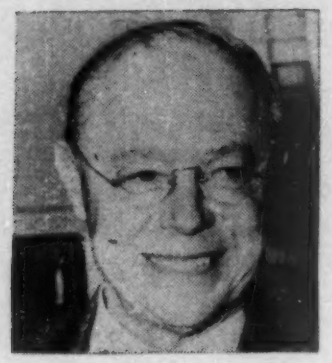
Inasmuch as President Truman himself asked for a "cooling-off" period in connection with his proposal for the use of fact-finding boards a year ago, the Administration will go along with some curbs against strikes.

Regulation of unions' internal affairs may not get very far. Speaking for Republicans most interested in the labor situation, Sen. Joseph H. Ball of Minnesota criticized this remedy as "superficial" and heading "in the direction of ever-increasing government control and regulation," which he said was "almost certain to be abused."

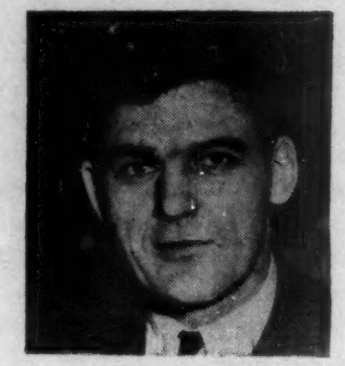
CLOSED SHOP

The so-called closed shop issue is simple and clear cut. But it goes beyond the closed shop question. Bills under consideration would outlaw any arrangement that made membership in a union a condition of employment. Unions will fight this harder than any of the other proposals and can expect Administration backing. They are likely to succeed in resisting this attack on their right to monopolize

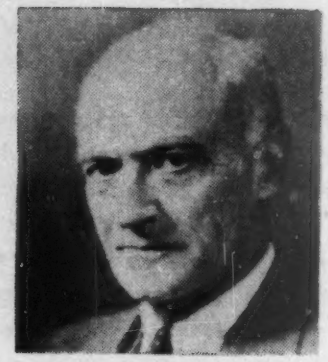
THESE MEN WILL STEER LABOR LEGISLATION



TAFT (R-Ohio)



BALL (R-Minn.)



SMITH (R-N.J.)

Press Association

labor even though they have suffered setbacks in six states that now ban closed shops—Arizona, Arkansas, Florida, Nebraska, South Dakota, and Alabama.

However, major changes in the Wagner Act which would alter its original concept will require considerable study and will be resisted vigorously by organized labor and possibly the Administration. Such changes would include, for instance, the problem of industry-wide bargaining, the declaration of unfair labor practices for unions, the requirement of unions to bargain, and possible division of the judicial and prosecution functions of NLRB.

LABOR BILL SPONSORS

What new laws we get, will be largely what Senate Republicans Ball, Robert A. Taft of Ohio, and H. Alexander Smith of New Jersey want. They carried the ball last year in scoring on the Case Bill, only to run into a Truman veto. They are not inclined to push through punitive legislation or to listen to the fringe in industry who want to wipe the Wagner Act, Wage-Hour Law, and Norris-LaGuardia Act from the books. Moderation is also urged in the Senate by Republicans like Wayne Morse of Oregon, Irving M. Ives, newcomer from New York, and George D. Aiken of Vermont.

House Labor Chairman Fred Hartley—a prime target of the PAC last fall—will likely join Howard W. Smith and Francis Case in writing more drastic legislation. But the tempering influence of the Senate will probably prevail.

With eyes on the presidency in 1948, the Republican majority can be counted on to move carefully and with moderation on the labor question.

WHAT CONGRESS WILL CONSIDER

Proposed measures that are sure to be considered by Congress fall into four categories:

1. *Measures setting up new machinery for settling disputes.* They include:

- A permanent mediation board, such as provided in the Case Bill;
- Fact-finding or emergency boards like those that functioned last year and have always operated under the Railway Labor Act;
- Compulsory arbitration and labor courts.

2. *Measures intended to create a balance in bargaining power.* They would:

- Discourage foremen's unions;
- Block industry-wide bargaining;
- Ban the closed shop;
- Require unions to bargain, and define what is meant by "collective bargaining";
- Permit employers to petition for employee elections;
- Make National Labor Relations Board decisions reviewable in court;
- Divorce the judicial and prosecution functions of NLRB;
- Grant employers more freedom of speech;
- Make unions liable to charges of unfair labor practices;
- Give employers a freer hand in dealing with strikers;
- Ban secondary boycotts;
- Apply anti-trust restrictions to unions.

3. *Measures aimed at restricting use of the strike weapon.* They include proposals that Congress:

- Make jurisdictional and sympathy strikes illegal;
- Ban strikes in public utilities and in certain "essential" industries;
- Make strikes subject to approval of the workers involved;
- Prohibit strikes while government machinery is operating in connection with the dispute involved;
- Allow injunctions or suits against strikes in violation of contract;
- Stop mass picketing and picket-line violence.

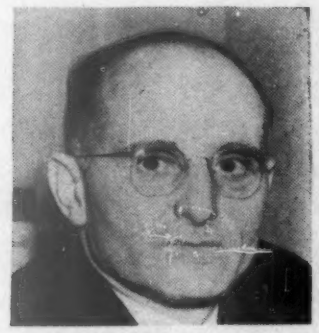
4. *Measures regulating unions so as to make them more democratic, more responsible to their membership and the country, and more considerate of individual rights.* Union regulation is sought to:

- Register, incorporate, and file financial statements;
- Conduct secret and regular elections of officers and secret strike votes;
- Fix reasonable initiation fees and dues;
- Obtain membership approval by secret ballot of union constitutions;
- Bar Communists from union office;
- Make union welfare funds to which employers contribute subject to joint administration.

IN THE EIGHTIETH CONGRESS

HARTLEY (R-N.J.)

SMITH (D.-Va.)



CASE (R-S.D.)

Acme, Press Association

LABOR'S ATTITUDE

In traditional fashion, organized labor opposes all of these proposals, even the most innocuous. It always has been the policy of union leaders to fight even the slightest regulation of union activities. They take this position not necessarily because of the particular change contemplated, but because of a fear that it might open the door to something more drastic.

For instance, many of the big unions, particularly those in the CIO, publish certified financial statements. Yet, when Massachusetts recently enacted a law requiring the filing of union financial statements, leaders of these same unions screamed to high heaven. Quite likely they suspected the next step might be to tell them how the money could be spent.

Union leaders see the establishment of any disputes-settling board as a possible interference with free collective bargaining. On this issue they join hands with the Truman Administration and most management leaders who are close to the labor situation. Industry spokesmen, however, raise the additional objection of more government interference: "Didn't the voters only two months ago ask for less of it?"

But a majority in Congress seems determined to devise some mechanism, be it a mediation board or labor courts, to adjudicate labor controversies. And some feel that compulsory arbitration is the only answer if we want to reduce, if not eliminate, crippling strikes in utilities and basic or essential industries. This is considered especially necessary if unions are not deprived of some of their powers, considered by many to be excessive, or incommensurate with their responsibilities.

ATTITUDES OF CONGRESSIONAL LEADERS

Compulsory arbitration of disputes in public utilities, urged in the Ball-Burton-Hatch Bill of 1945, has been revived by Representative Smith. He would make it an unfair labor practice for either employer or union in this field to refuse to include in their bargaining contract a provision for arbitration of disputes.

Senator Ball in the past year has turned away from compulsory arbitration on the basis that it leaves decisions affecting the very existence of a company or a union to the arbitrary judgment of one man without any general standards or rules to guide him. For the same reasons he dislikes the use of labor courts for settling disputes.

The Minnesota Republican makes an exception, however, of disputes in electric, gas, and water utilities because they are licensed monopolies whose rates and profits are fixed by government. Since the rate fixing is done almost entirely by the states, Ball believes the states should take the initiative in solving this problem. Some, including Virginia and New Jersey, already are giving it attention.

Establishment of labor courts to settle disputes has been advocated by Sen. Homer Ferguson and Sen. J. William Fulbright. Ferguson's plan calls for a whole network of labor courts paralleling the Federal Court system from the Supreme Court right down to the district level. Except for rare cases in which the general welfare is seriously endangered, he would leave disputes involving new contract terms to collective bargaining and a permanent mediation board when that failed.

The courts would deal almost exclusively with interpretation and endorsement of existing contract terms. Contracts would be filed with the court after they were signed. Decisions would be binding on both parties. Ferguson holds that many more strikes occur over interpretation of a contract than over new contract issues.

Fulbright's ideas differ from Ferguson's mainly in that he favors one big court in Washington for settling national disputes in essential industries.

WHAT WILL CONGRESS DO?

The Republican leadership in Congress knows new laws cannot solve all the difficulties of either management or unions. As aptly expressed by Senator Ball, new laws merely can lay the foundation for "more intelligent, liberal, and courageous leadership" on both sides.

A very brief summing up of FACTORY's study in probabilties shows that Congress is likely to provide for:

1. A permanent board for *settling* major disputes;

2. Compulsory arbitration very restricted in its application;

3. Changes in the Wagner Act to bring about a better balance of bargaining power;

4. Curbing of strikes, but not their elimination. The government will be exempted from the Norris-LaGuardia anti-injunction law;

5. Little restriction, if any, on unions in regard to their internal affairs.

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☆ Good Labor Relations Are the Responsibility of All of Us

Congress — in attempting to remove injustices from labor legislation — is to hear much testimony from representatives of labor and of management.

Fight though they may among themselves, labor spokesmen will present a solid front to "insure unity of action" in opposition to changes in the labor law.

Management will present a strong case for moderate revision. But the spokesmen — and the resolutions of management groups — indicate that there will be no vindictiveness. The right of collective bargaining is firmly established, labor's gains are recognized, and the right to strike when no other resort is possible is upheld.

Observers and analysts point out that the objective should be less regulation, not more. Both sides dislike compulsory arbitration because it gives bureaucracy, planners, and regimentation a broad wedge to extend government control of wages and prices.

CONGRESS FACES DELICATE TASK

Sweeping changes in the law must come gradually, too. Some in management feel that the best way to overhaul labor laws would be to scrap the Wagner Act completely and write a new law which would maintain the rights guaranteed by the Wagner Act, but would apply equitably to both employers and employees.

Most spokesmen, however, have pointed out that scrapping the Act is politically inexpedient. In the same way, scrapping the Norris-LaGuardia and Clayton Acts so that unions would be thrown back under the Sherman Act would merely return unions and industrial relations to the conflicts of 1910. Unions, obviously, must be limited in their monopoly powers, but Congress will have to use precision tools to restrict the abuses and still maintain the functions necessary to free unions.

Labor's arguments against repressive legislation have been used — paradoxically — by management spokesmen in pointing out the danger of too drastic restrictions. After 15 years of almost unbroken pro-labor administration and pro-labor legislation, the tide is turning. But sweeping restrictions, such as an attempt to outlaw all strikes, can result only in more industrial conflict.

When it comes to presenting its case to Congress, management spokesmen will be backed by polls clearly showing that the nation as a whole backs changes in the labor laws which will reduce the number of strikes and limit labor's broad powers. FACTORY polls show that even union members in the manufacturing industries believe — among other things — that unions should be made responsible for collective bargaining contracts, should be penalized for violence on the picket line, and should make public accounting of their funds.

The polls, the election returns, and the mood of Congress and the Administration all indicate that the only opposition to some changes in the labor laws will come from union leaders. And their influence is at a 15-year low. Also, for the first time in years, the public is not blaming management and management alone for strikes and work stoppages.

In correcting laws stacked deliberately for unions, Congress may pass the point where responsibilities are equalized, and end up by restricting unions too severely. The Clayton Act exempting unions from anti-trust action, the Norris-LaGuardia Act, which finally protected unions from a flood of injunctions, and the National Labor Relations Act, guaranteeing collective bargaining, all came out of situations intolerable for unions. Old-line employers who concentrated on building the wealth of a nation but neglected the welfare of workers, and judges whose thinking was limited by laws guaranteeing property rights, fought hard — and sometimes viciously — to kill the whole idea of unions.

Under that repression, unions had to concentrate on conflict and not on cooperation. We are still paying the price for it. When Philip Murray and John Lewis talk of "conspiracies to destroy the labor movement" or "yellow-dog injunctions," they are still thinking of the gun-fighting warfare of the coal mines which occurred forty years ago.

Conflict grew under the National Labor Relations Act. Unions made full use of unprecedented powers. Management, with the law and public opinion against it, fought stubbornly, feeling that it had to fight to maintain the functions of management.

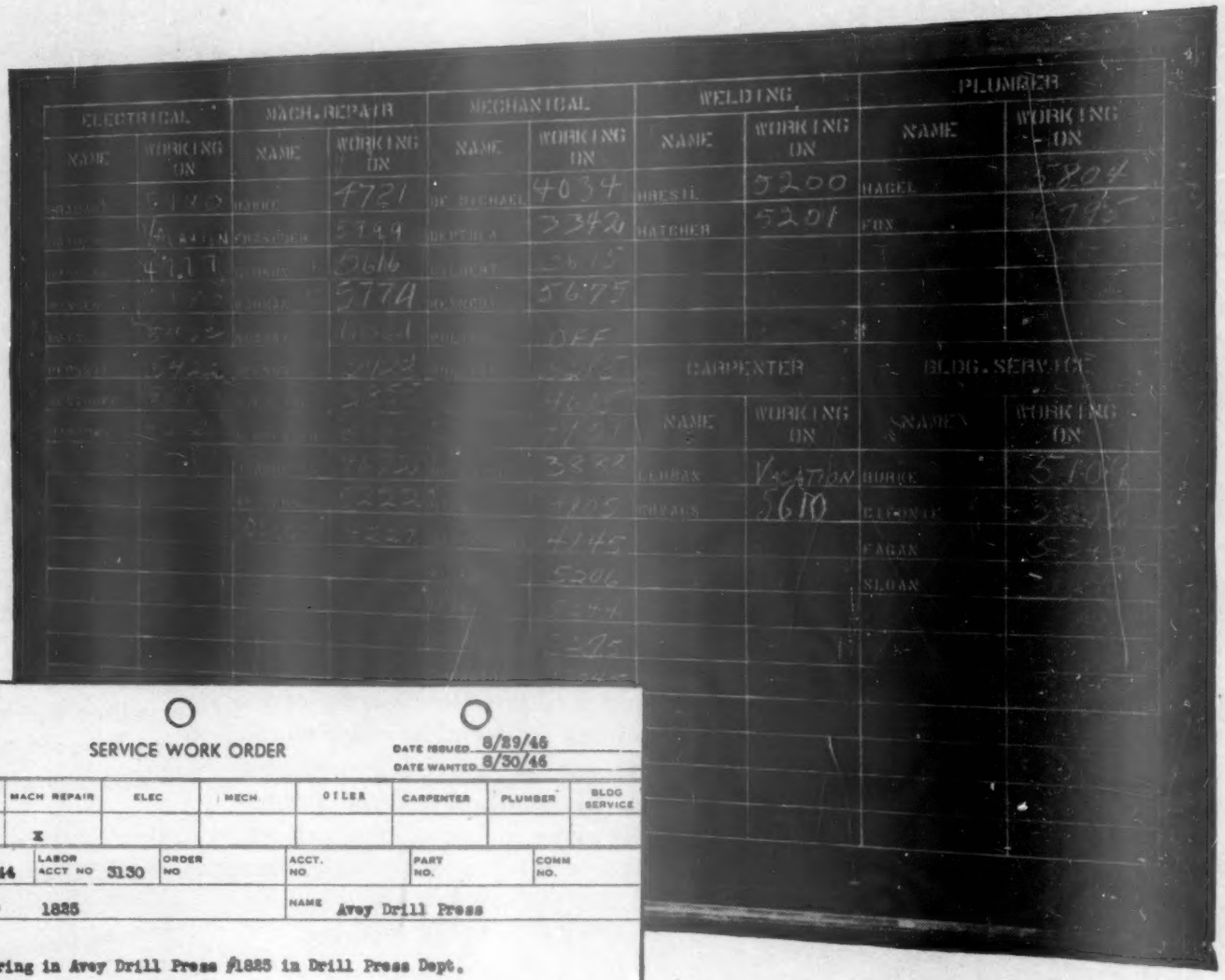
COOPERATION IS ESSENTIAL

So — the initial step toward labor-management cooperation is equality before the law. Just laws, though, are only the beginning. Management leaders and progressive labor leaders must go on from there to work out, on a nation-wide scale, the cooperation that exists in a few companies. There are enough leaders now in both management and labor to show the way.

If labor and management do not achieve that kind of cooperation on their own, if leaders cannot find ways of working together in the public interest, then government will move in. The function of government is regulation. Too much regulation is the end of free enterprise and of free unions.

SPEEDING UPKEEP WITH JOB SCOREBOARD

JOHN M. McGREGOR • VICE-PRESIDENT IN CHARGE OF MANUFACTURING
SIGNODE STEEL STRAPPING COMPANY, CHICAGO



4721 SERVICE WORK ORDER

DATE ISSUED 8/29/46
DATE WANTED 8/30/46

TOOL DES	MACH. DES	TOOL RM	MACH REPAIR	ELEC	MECH	OILER	CARPENTER	PLUMBER	BLDG SERVICE
			X						

REQUESTED BY A. Luberda | MATERIAL ACCT NO 3144 | LABOR ACCT NO 3130 | ORDER NO | ACCT. NO | PART NO. | COMM NO.

DEPT. NO. 31 | MACHINE OR EQUIPMENT NO 1835 | NAME Avey Drill Press

DESCRIPTION OF WORK:
Replace spindle bearing in Avey Drill Press #1835 in Drill Press Dept.

DATE	CLOCK NO.	OPER NO.	HOURS	CHECK	DATE	CLOCK NO	OPER. NO.	HOURS	CHECK	DATE	CLOCK NO.	OPER. NO.	HOURS	CHECK
F 32-21														

ISSUED BY 1B DISPATCHER

(OTHER SIDE TO BE COMPLETED BY MECHANIC)

Job-assignment board (above) gives overall picture of where maintenance men are and what they are doing, thus helps the department use its personnel to best advantage. Job number on the board ties in with the work order illustrated at the left

A line-up for fast work, high-average performance, and no errors is provided by a large job-assignment board in Signode's maintenance department.

Each workman in the department is responsible for placing or removing the work order number opposite his name. The operation is easy. The result is control of job assignments.

The numbers on the control board refer to work orders, which are issued by a dispatcher in the plant engineering department. The orders, filed in sequence, describe each job and list the location.

An over-all picture of maintenance department work is thus shown on the job-assignment board, and the reference number tie-in with the work order makes it possible to locate quickly any workman. This is especially valuable when an emergency job calls for the services of any of the department's skilled employees.

The job-control board is well accepted by members of the department. A boost in morale has been indicated because of the individuality that a man feels when his name appears in print. Another by-product is a hardy spirit of competition resulting from the workers' desire to change numbers on the board as frequently as possible.

25 PER CENT MORE PRODUCTS HANDLED AND STORED BY 63 PER CENT FEWER PEOPLE

C. R. NEWPHER • PRODUCTION MANAGER, RELIANCE ELECTRIC & ENGINEERING COMPANY, CLEVELAND

A new warehouse, centrally located and especially laid out to fit Reliance needs, will save the company an estimated $150,000 a year.

Much of this saving must be attributed to maximum utilization of vertical storage space and to extensive use of mechanical handling methods. As a result, 31 people are now able to handle 25 per cent more parts than 80 people could handle under the previous set-up. This constitutes in itself a saving of just about 100,000 man-hours per annum. It means 49 people transferred to productive jobs.

OLD FACILITIES

Formerly, the company maintained three storage sections, totaling 10,000 square feet, in the main plant.

To meet expanded production requirements in recent years, when construction was rigidly restricted, the company rented an additional warehouse. It contained no shelving. Aisles occupied about 18,000 of its 48,000 square feet of space. It was located at some little distance from the main plant. Monthly trucking expense between warehouse and plant was $1,000.

NEW FACILITIES

Capacity of the new warehouse, which adjoins the main plant, was planned to match the former facilities, but with layout and location engineered for top efficiency operation. Total floor area is 48,000 square feet, allocated as follows:

Receiving	3,000
Inspection	2,000
Office and lavatories	3,600
Aisles	22,000
Storage shelves	19,400

Although only 19,400 square feet of floor area is occupied by shelving, the effective use of vertical storage increases the actual storage area to well over 50,000 square feet (as against a total of 40,000 previously available). Also, whereas the old facilities were always overcrowded, there is still room for more in the new warehouse.

First impression on entering is one of spaciousness—attributable in a large part to oversize 15-ft. aisles. It was recognized at the outset that power trucks could be operated satisfactorily in 12-ft. aisles, but it was also reasoned that the extra space would facilitate the clearing of the receiving platform. In other words, parts can be moved immediately from the platform, stored temporarily along the side of the aisle adjacent to the proper storage space, and then put away at a time when no material is being received.

MECHANICAL HANDLING

Much of the saving in man-hours is due to planning the layout for extensive use of mechanical handling equipment:

1. Two 2-ton and two 3-ton fork trucks.

2. Four small power-operated lift trucks.

3. Two 3-ton and one 1-ton manually operated crane-type hoists.

4. Roller conveyor line for inspection of incoming raw stock and purchased parts.

5. Hydraulic lift for removing materials from trucks whose floors are substantially above or below the receiving platform.

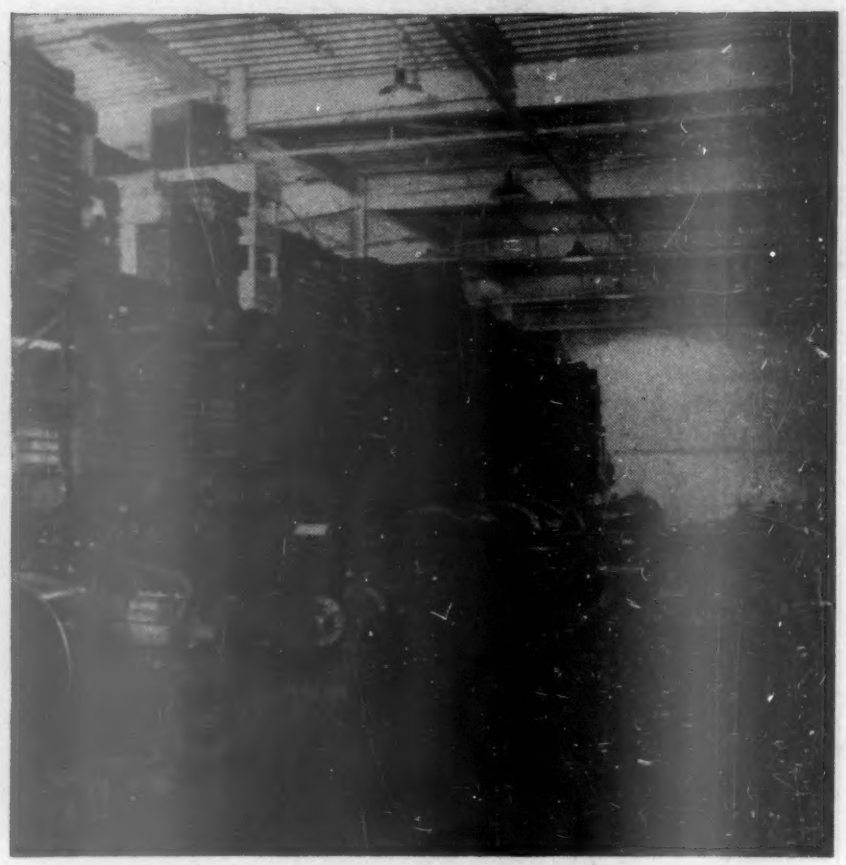
The two 3-ton hoists service the receiving platform, which extends across two of the four bays in the warehouse. Heavy loads can be switched from one bay to the other without being set down. For loads totaling more than 3 tons, the two hoists can be worked as a team.

WORKER COMFORT

Electrically operated overhead doors on the receiving platform and similar equipment at other exterior openings contribute to effective maintenance of comfortable working temperatures. Eighteen overhead heating units can each deliver 175,000 B.t.u.'s per hour, which guarantees 70 degrees in cold weather. For summer comfort, there are 25 roof ventilating fans, each with a capacity of 8,000 c.f.m.

1

2



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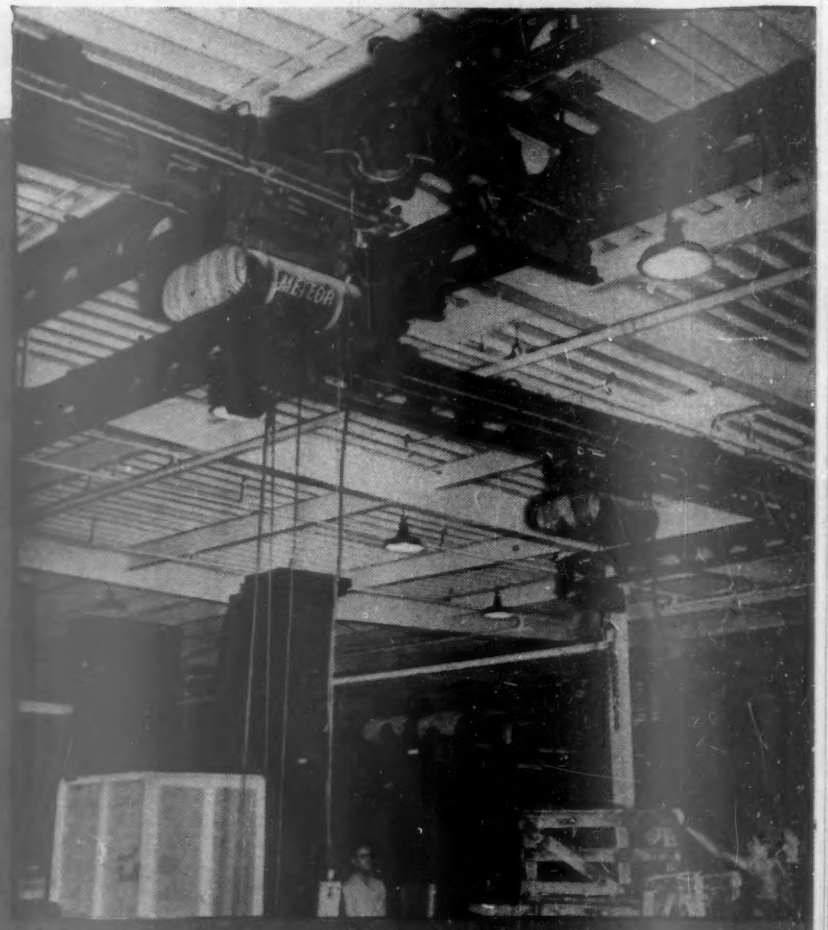


1 Mechanical handling is a major contributor to the $150,000 annual saving Reliance expects to make with its new centralized storage facilities. Fork trucks allow full use of vertical storage space. Parts stored on pallets can be moved in or out with little effort and in quick time

2 Aisles are 15 feet wide. Such generous width eliminates need for jockeying trucks to get at material. Also, it makes emergency storage space available in the aisles. Shown here are motor and generator assemblies which have been temporarily removed from the production floor

3 Crossover between crane runways makes it possible to move loads from one bay to the other without setting them down, and permits two cranes to team up on an especially heavy lift

CONTINUED ON NEXT PAGE

4

5

4 Racks of various types provide flexibility, make it possible to store the variety of parts and materials needed to build motors in a wide range of types and sizes. Note how, here, less-active and large items are stored close to the ceiling

5 From both ends toward the middle. Process parts from the plant move down the inspection line from the right; purchased parts and materials travel up the conveyor from the unloading platform from the left. All items are unloaded at the center of the line and moved to storage

6 The loading dock is big enough to accommodate four highway trucks of the longest type. Electrically operated doors can be closed in cold weather and temperature kept at 70 degrees

6

7

8

7 Height of platform fits most truck bodies. Hydraulic lift at one unloading station makes it possible to raise or lower trucks whose floors do not align with the platform. Lift is operated from a pushbutton station on the platform

8 Yard storage, too, has been revamped. Compare orderly scene above with disorderly appearance of yard storage areas in most plants. Note use of skid platforms for quick moves

9 Loudspeaker system for paging (and music) and an intercommunicating system, with stations spotted through the warehouse, expedite movements of parts and materials. If parts are urgently needed by a production department, a stockman can get instructions without going to the office

9

CONTROLLING RAW MATERIALS TO MEET VARYING PRODUCTION

R. L. BOWLES • PRODUCTION PLANNING MANAGER, ARMSTRONG CORK COMPANY, LANCASTER, PENNSYLVANIA

Mathematical formulas for control of the thousands of materials used to produce its 360-odd commodities? Magic paperwork that substitutes for human judgment? Not at Armstrong. Instead a single past-history form which enables management to make the many decisions needed for the proper control of raw materials

The maintenance of raw material inventories at a level low enough to keep warehouse and storage costs at a minimum, yet high enough to prevent interruptions of manufacturing operations, is a challenging problem which must be faced constantly by production control managers. When the demand for raw materials varies substantially with seasonal and other influences, as at Armstrong Cork, the problem often offers serious complications.

All too often solution of this problem is attempted by resorting to some mathematical system or formula which eliminates the necessity for judgment and reduces the important function of control to a matter of simple clerical detail. Even companies that normally require the judgment and approval of a highly paid executive before making relatively small expenditures for capital equipment, frequently are guilty of assuming that some cure-all paperwork system can substitute for human judgment in making the many decisions needed for the proper control of raw material inventories. But admittedly, no such system can ever entirely replace judgment. A system can be used only to gather and organize details so that judgment can be exercised easily.

For the control of the thousands of raw materials used in the production of the 360-odd commodities manufactured by the Armstrong Cork Company, several different systems have been devised. The choice of which system is used to control the raw materials of each commodity depends primarily upon the manufacturing and selling conditions existing for that commodity. The basic objective behind all of its systems, however, is to make control as simple as possible without restricting management's opportunity to use judgment.

In some types of manufacture the problem of raw material control is a relatively simple one. For example, in a business which operates on rigidly fixed schedules, future material requirements can be determined accurately and well in advance of its needs.

But there are many enterprises, such as Armstrong Cork, in which the rate of raw material usage fluctuates with the varying demand for items to be manufactured and is dependent on changes in customer preferences and manufacturing formulations and specifications. Consequently, it is impossible to determine accurately by any system or formula just what future raw material requirements will be.

Many enterprises of this kind attempt to regulate their inventory of raw materials by application of the well-known "maximum-minimum" control system. In the common operation of this system, the average usage of each raw material during the past three to six months is determined by referring to past records. Usually the "minimum" inventory for each material is then established as the amount of material that was used, on the average, during the time that it normally takes to place an order and secure delivery of the material to the factory. The "maximum" inventory is established as the "minimum" inventory plus the "economical order" amount.

On the surface, the maximum-minimum system may seem entirely workable for adequate control of inventory where complex and fluctuating factors of usage are involved. It is popular because its use makes it possible for any clerk to control raw material inventories within limits established by management—limits that management can revise at will. Moreover, the system as established at most companies clearly designates some responsible individual in management who will revise the limits at stated intervals of, perhaps, three or six months.

PAST IS UNRELIABLE

But a close analysis of the maximum-minimum system, supported by actual observations during its former application to the stated conditions at Armstrong Cork, reveals definite faults and omissions. In the first place, in this system maximum and minimum limits are established solely on the basis of past usage. This in itself is a fallacy, since in the manufacture of extremely few commodities can the past be considered a reliable indicator of the future. If, for example, usage of a commodity is increasing, such a system will result in a constant shortage of raw materials. If it is decreasing, inven-

tories will become too large. If there are seasonal variations in usage, excess quantities of materials will be ordered during periods of low sales, and materials will be short during periods of high sales. These tendencies show, in brief, that under unstable conditions inventories must be carried for future requirements, not past requirements, and limits must be based on some determination of future needs.

A second fault of the maximum-minimum system is found in its definition of minimum inventory. To illustrate, under the present unsettled conditions it is almost impossible to determine how much time will be required for the delivery of any order, and it is seldom indeed that a company can depend upon delivery within the standard time for two orders in succession. But even under normal conditions, is it practical to wait to place an order for raw material until there is just enough time to get the order filled before the stock of the material runs out? Isn't it more reasonable to place orders well in advance of needs, specifying a delivery date and requiring acknowledgment from the supplier that he can fill the order on that date? Of course, this latter practice presupposes that a relatively accurate plan has been made for future production. In actual operation, if it is found that usage has been either overestimated or underestimated, it is usually possible to change the specified delivery date accordingly.

CORRECTION NEGLECTED

A third basic fallacy discovered in the maximum-minimum system relates to the necessary procedure of correcting the inventory limits at intervals of three or six months. Because this task is seldom a part of the routine work of the individual in management to whom it is assigned, it is one that can be, and frequently is, "put off until later." In many actual instances where procedure states clearly that management shall correct the limits every three months, the date of the last correction is found to be three or four years in the past.

In answer to the shortcomings of the maximum-minimum system of inventory control for those materials for which future usage cannot be predicted at long range with any degree of accuracy, a system has been devised at Armstrong Cork which employs routine clerical effort for the time-consuming assembly of pertinent inventory data and relies upon brief executive perusal of these data for intelligent control. The basis of this system is a single form on which all the factors relating to supply are shown in such a way that proper administration of the executive functions are made possible without being burdensome.

In this system the individual who exercises the judgment necessary for good control is either the man-

Although no direct basis of comparison is available between results from former methods and the present method of raw materials control, it can be said that shortages caused by failure to order are rare, and inventory turnover figures are better than average. Best of all, the objective of proper executive control with a minimum expenditure of time has been achieved

Successful application of this system for efficiently controlling raw material inventories depends upon the careful preparation of the past-history form, which the planner uses in combination with his knowledge of future production plans to estimate future needs

YEAR	DIVISION	UNITS	COMMODITY
1946	Glass & Closure	Pounds	#26 Powder

REMARKS:
Major Use for Jar Covers
80 lb./Bag
82,000/Mo. 1945
40,000 lb./Car—3 Days Shipment
Storage Capacity—10,000 lb.

Time Required
8 Weeks

INVENTORY	USAGE Weekly	USAGE Accumulative	RECEIPTS		ORDERS
60.116	22.400			1	12/12/45 — 1 CAR 1/12 — 1/25
41.496	18.620	41.020		2	1/8/46 — 1 CAR 2/6 — 2/12
59.916	21.580	62.600	40,000	3	
39.201	20.715	83.315		4	
56.991	22.210	105.525	40,000	5	2/6/46 — 1 CAR 3/8 — 3/22
32.491	24.500	130.025		6	PATTERN 6521 HEAVY USER
51.291	21.200	151.225	40.000	7	
31.741	19.550	170.775		8	SATURDAY OFF
55.616	16.125	186.900	40.000	9	
35.984	21.632	208.532		10	3/5/46 —
53.773	20.211	228.743	40.000	11	3/9/46 — DEFER TO 4/12, 4/26
38.351	15.422	244.165		12	REDUCED TO 40 HRS/WK.
60.461	17.890	262.055	40.000	13	

ager of the plant production planning department or the supervisor of the inventory control section within that department. It is his responsibility to have always on hand sufficient inventories to maintain operations. He must also consider storage facilities, purchase price, and cost of investment so that he can take advantage of economies in purchasing.

The choice of this executive for this function is dictated by another important reason. His working familiarity with future production plans of each commodity uniquely qualifies him to make the decisions for inventory control. He knows whether the general volume of production is to be increased or decreased, and by what proportion. He has at his fingertips not only the production schedules for weeks or months to come, but also a knowledge of any changes in these schedules. If, for example, a third shift is to be added, he is in a position to know that the rate of usage will be increased one-half over the average usage in the past, and that orders should be placed accordingly. In short, by correlating past performance and future plans with judgment and experience, this individual is in a position to determine raw material needs with a high degree of accuracy.

The single form, or record of past performance, on which this individual bases his judgment is shown on page 95. Each commodity controlled by this system requires one sheet, which is usually of loose-leaf type, letter-size, and kept with all others in a convenient ring binder.

At the top of each form is noted the commodity, purchase units, and the manufacturing division using this raw material. In the "Remarks" space immediately below these data are shown informative details as to the final product, average monthly consumption for the previous year, units of shipment, amount of time usually required for shipment en route, available storage capacity, and time required for delivery after date of order. Delivery dates are worked out with the purchasing department.

The five vertical columns in the body of the form are designed to list progressively the amount of material on hand at the end of each week, the amount used during the week, the accumulative usage of the material for the year, the amount of shipments, if any, that were received during the week, and a listing of orders outstanding for new material.

The 52 lines below these column headings are for entries for each of the 52 weeks of the year. Numbering these lines makes it easy to determine the average weekly usage for any time in the past. For example, the average usage of weeks 3 to 12 can be figured by subtracting the accumulated usage on line 2 from that on line 12 and dividing the result by 10.

Additional notes on the right side of the sheet indicate the reasons for any wide variations in usage and serve as a basis for predicting whether or not such conditions may arise again.

All data on the entire sheet, except those in the "Orders" column, are entered by clerical routine. The few notes in the "Orders" column are the results of executive scrutiny.

Once each week the executive in charge of inventory control reviews the information on each sheet to determine whatever action is necessary to correct inventory plans in the light of current developments. Inspection of the columns showing actual usage of a material, and comparison of weekly amounts with the average for, say, the past ten weeks, indicate the variation that may be expected from the average and, hence, the minimum inventory the controller should plan to have on hand whenever a new shipment is received.

Only two hours each week are required for a plant production manager to review with his supervisor of inventory control the history forms for approximately 150 commodities

CARE AND JUDGMENT

The success of this system depends upon the careful preparation of the past history form which the planner uses in combination with his knowledge of future production plans to arrive at an estimate of future raw material needs. It depends also on the planner's knowledge of current supply conditions for each material, to guide him in determining when orders should be placed and what delivery date should be indicated. In practice, an experienced man can maintain close inventory control of 150 different raw materials in from an hour and a half to two hours a week. Thus the objectives of proper executive control with a minimum expenditure of his time seem to have been achieved.

No basis of comparison is available between the results from the former methods and the present method. But this much can be said: Shortages caused by failure to order are rare. Also, comparisons of inventory turnover at Armstrong Cork with industrial figures, whenever available, have shown that its figures are better than the average for the respective industries.

FALLACIES OF THE NATHAN REPORT

Prepared by the McGraw-Hill Economics Department

The CIO has launched a campaign for substantial wage increases and has added the condition that price increases must not follow. Its position is buttressed by a report entitled "A Wage Policy for 1947," which was prepared for it by Robert R. Nathan Associates.

This report endeavors to prove that a wage increase of 21 per cent in manufacturing and 25 per cent in over-all corporate business can be made without price increases, and that this would not decrease corporate profits below 6.9 per cent of net worth, which was the 1936-39 average rate of return.

Several points should be noted in this regard. The calculations used in the report are based on Nathan's estimates of profits for the fourth quarter of this year. Indications are that this quarter will be the peak for profits, since most economists predict that, with industry shifting to a buyers' market, the level will not be maintained in 1947. And, in making the comparison with 1936-39, it should be pointed out that the average of 6.9 per cent is below that which industry needs in its years of high-level output.

The report concedes that its conclusions "do not apply exactly to any individual industry. Obviously, the profit-and-wage picture must be considered separately in each wage negotiation." This is very important because the report does not give profits data for durable goods industries alone, and it is in these industries that CIO has its major strength. Their profits, even by the end of 1946, may be considerably below the average level of all manufacturing. For example, in metal mining, electrical equipment, aircraft, and automobile industries, profits are down compared with a year ago.

If the profit position of individual industries must admittedly govern wage negotiations, what is the significance of the Nathan report? Presumably it suggests a pattern for wage increases to all labor. But, as the box in the center of this page points out, over three-quarters of all national income goes to labor. To attempt to increase this dollar income without increasing prices would make serious inroads on income flowing to those who own property and investments. The fact that, over the years, the share of national income representing return for personal effort has borne a nearly constant ratio to income on investment—roughly 75-25—suggests that the economy would strike a balance by further price rises.

One factor in this is that, while total civilian labor force is now larger than at any time in the history of the country, including the war period, industrial production is not as high as that maintained throughout the war years. A year ago, overtime largely disappeared, and with it output and pay checks went down. Labor wanted to maintain the same take-home pay for 40 hours that it had received before for 48. Wage increases were gained, but with no increase in productivity many industrial prices had to go up, and part of the wage gain was lost.

Payments to labor take at least 75 per cent of all income. In all industry, in the typical year 1939, wages averaged 16 per cent of the selling price of industry's products:

Manufacturing Costs in 1939 (in billions)

Wages	9
Salaries	2.5
Operating and fixed costs	13.5
Raw materials	32
Total value (selling price) of all manufactured goods	57

When salaries are included the labor bill goes up to 20 per cent of selling price. But the big item is raw materials, and an important share of their cost is for labor. For example, in coal mining, wages are 65 per cent of the selling price. To understand just how much of over-all income goes to labor, the problem must be approached in terms of national income:

National Income (in billions)

Annual Rate Based on First Half '46	
Compensation to employees	106
Dividends, corporate savings	11
Agricultural proprietors	13
Unincorporated businesses	15
Interest, rents	13
Total national income	158

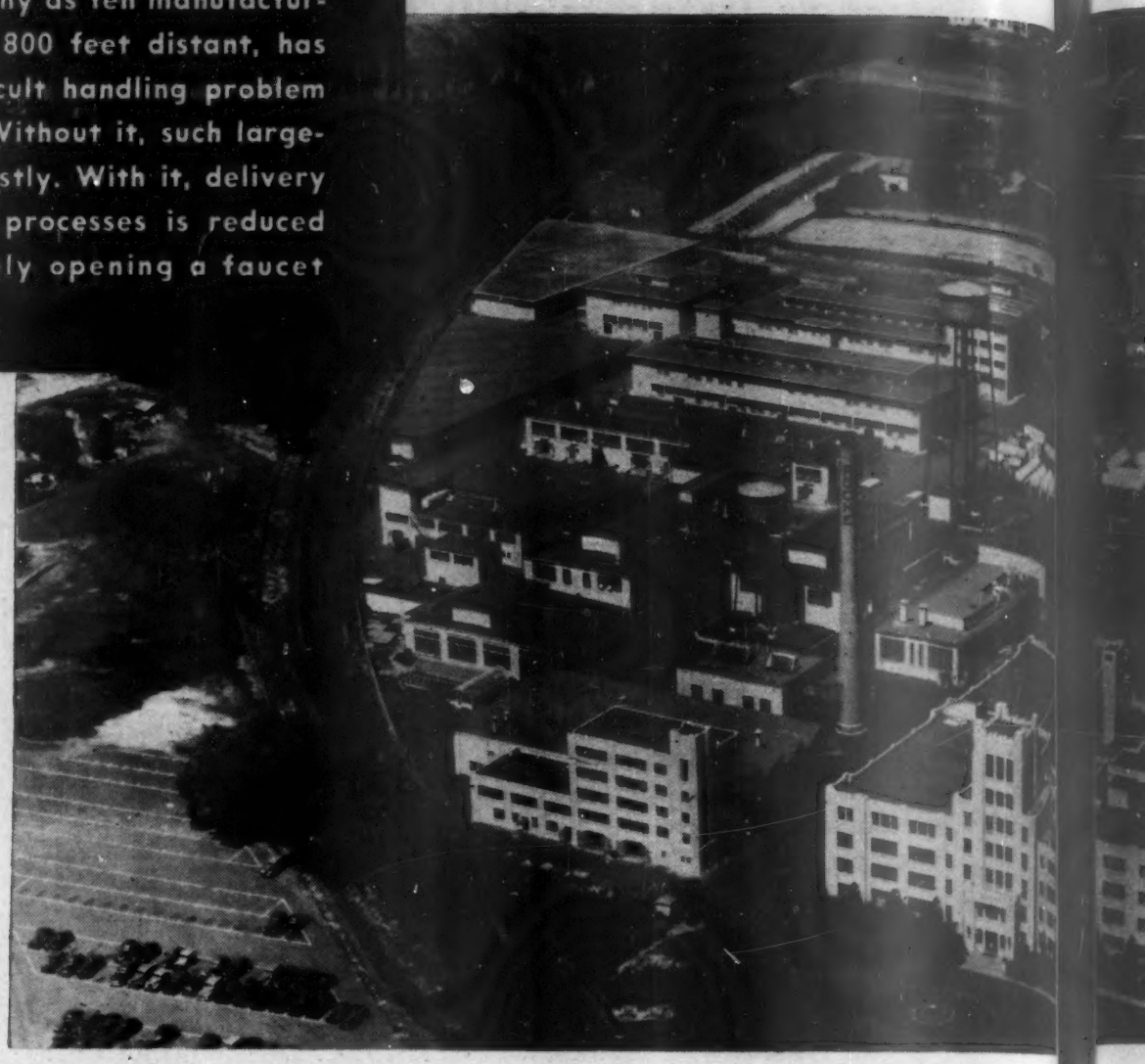
Compensation to employees is 67 per cent of all national income. Another 18 per cent goes to unincorporated business—farming, service industries, and professions. The bulk of their income is compensation for personal service, similar to payments made to a wage earner or salaried worker, and fluctuates with the wage level. This must be included in estimating labor cost and it boosts labor's share to at least 75 per cent of all national income.

LESS WORK, SAME TAKE

This time the CIO program is wage increases without price jumps. *But past experience indicates that large wage demands will again produce either higher prices or strikes.* The point is that real wages tie up to productivity, and, with more people making less, there is less to divide up. What the Nathan report proposes—assuming that some control could prevent prices from going up—is to take half of the share of national income going to property and investment and to divide it among the labor force, giving labor the same take for less work.

It is more than likely that, instead of all labor, only the organized segments of labor would get increases of such a magnitude. CIO, for which the Nathan report was made, represents less than one-tenth of the labor force and all organized labor only about one-fifth. Gains would be at the expense of unorganized labor, which would not have more money with which to pay the higher prices that could be expected to result from wage gains of the size CIO has proposed.

Centralized tank storage of liquid chemicals, with pipeline distribution to as many as ten manufacturing buildings, some of them 800 feet distant, has simplified an otherwise difficult handling problem at Hoffmann-La Roche, Inc. Without it, such large-scale operations would be costly. With it, delivery of chemicals to the various processes is reduced almost to the ease of merely opening a faucet



HOW TWO MEN STORE AND DISTRIBUTE MILLIONS OF GALLONS OF LIQUIDS

JOHN E. MEYER • PLANT ENGINEER, HOFFMANN-LA ROCHE, INC., NUTLEY, N. J.

Efficient and safe receipt, storage, and distribution of liquid bulk materials is a problem in many manufacturing industries. It has been solved at the Hoffmann-La Roche pharmaceutical plant by a system that enables two men to handle and account for millions of gallons annually of commercial solvents, alkalis, and acids. Waste is negligible, and entire inventory position can be given at a few hours' notice.

The basis for this achievement in liquid materials handling is the centralization of all storage tanks in a fenced-in "tank farm" located in the heart of the plant area. From this tank farm extend underground distribution pipelines for pumping the liquids to eight surrounding multi-storied "manufacturing" buildings at pipeline distances up to 800 feet.

Noisy and labor-consuming rolling around of drums is minimized, and deliveries to departments of carboy or lesser lots on hand trucks are done on a minor scale.

Something of the care that went into the planning of this tank farm installation is evident from the arrangements right at the start for receiving the solvents and acids. Railroad tank cars roll onto a leveled side-track alongside the tank farm. Contents are immedi-

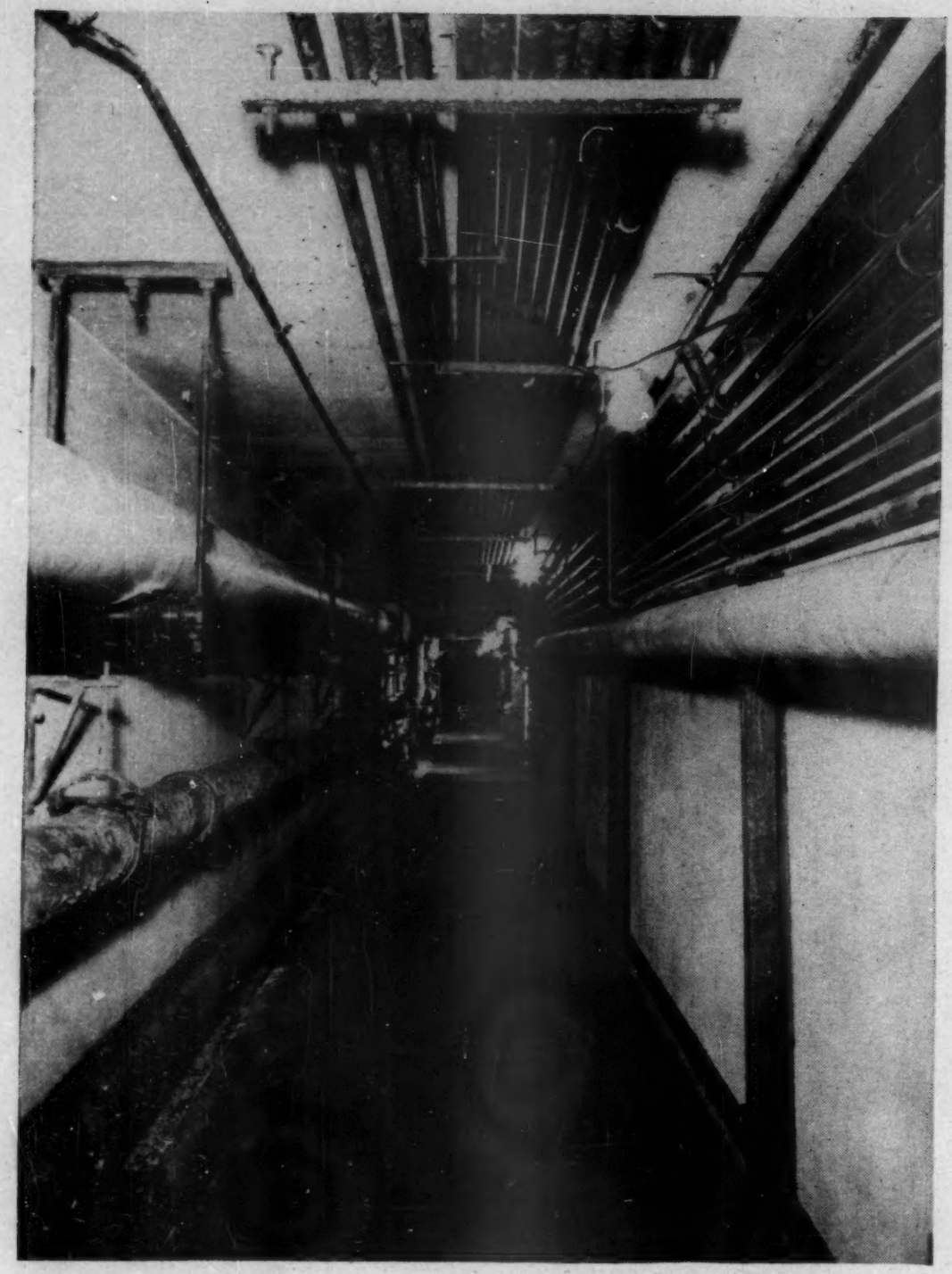
Air view of 104-acre plant shows centralized location of tank "farm" where all liquid chemicals are delivered and stored for distribution by underground pipelines to surrounding manufacturing buildings. At right is closer view of tank farm from opposite direction, showing one-story meter house (by arrow) used for control of distribution

ately sampled, and, while being tested for quality, a guard in 3-hour shifts is set. Cars are never left unguarded, and usually go out empty on the day of arrival. There is similar provision for tank truck deliveries.

The principal chemicals handled at the tank farm are ethanol, methanol, acetone, benzol, and chloroform (most of which are of the flammable solvent type), also muriatic acid, bleach, and caustic soda (all having corrosive properties to a more or less degree). Most of the solvents are stored in ten underground steel tanks, of capacities up to 16,000 gallons. Other solvents and chemicals are stored above ground in the open air in twenty steel or lined tanks set on concrete foundations, varying in capacities from 4900 to 20,000 gallons.

Unloading of liquids from tank cars and trucks is by either of two methods. Solvents for underground storage are drained by gravity. A small brick "fill-house" alongside the siding contains the inlet valves and connecting hoses for this operation. From here 3-in. underground fill pipes lead to the tanks. Flame arresters protect all fill pipe and vent openings.

Chemicals for aboveground tanks must be blown out of tank cars by compressed air (acids and caustics) or pumped out (solvents). For the former, air receivers maintained at



There are no overhead lines in this plant. Liquid chemical distribution lines run through an underground tunnel system, designed to carry all plant service piping, which forms a ¾-mile rectangular loop around the plant and has exits to every building. All distribution lines are of welded joint construction, and tunnels are inspected daily for leaking pipes

30-lb. pressure are located on the premises. For the latter, a 300-g.p.m. bronze pump, driven by an explosion-proof motor, is used. It is mounted beside the side-track near the fill house, and has its outlet permanently connected by piping and a valve manifold to several 3-in. underground pipelines leading to the various storage tanks it serves.

All fill lines in this area, either to underground or aboveground tanks, are run underground. The fill lines for the aboveground acid and solvent tanks are terminated in a group of risers, each with valve and hose nipple, located just outside the fill house. Temporary connections from the tank car either to the air supply or pump inlet, and also to any fill line, are easily and quickly made or disconnected.

Safe practices are observed in the unloading operations. Wherever possible, tank cars are unloaded from the top as the safest method. Special rubber-lined hose is used for unloading solvents, and temporary and permanent pipe connections of iron, brass, stainless steel, or special alloys are used for alkalis and acids. Hose is never put under pressure, but connected to the suction side of the hook-up. Pipelines are always connected so as to discharge into the top of a storage tank. There are no bottom outlets on acid tanks; they are always emptied by syphoning. Even when emptying tank cars by pumping, the operation is started by syphoning out of the top. And touching further on safety, whenever a solvent tank is emptied for cleaning a few 50-lb. cakes of dry ice (carbon dioxide) are dropped into the manhole until cleaning operations begin.

Since solvents constitute about four-fifths of the volume of liquids handled in the plant, special attention has been given to simplifying their receipt, storage, and distribution. The solvent storage tanks are arranged along two opposite sides of a large underground concrete vault, leaving a center aisle for regular inspection and maintenance of the steel tanks, steel piping, and accessory equipment.

INDIVIDUAL CONNECTIONS

Each solvent storage tank is individually connected through a pump and meter to its own main distribution line which leads to the various buildings needing that product. All but one of the solvent distribution lines are run in a reinforced concrete tunnel, large enough to walk in, which forms an underground rectangular loop inside the plant area almost three-quarters of a mile long. The remaining line runs underground cross-lots to cut down the length involved in using the loop. In the loop tunnel also are found all other service lines of the plant, including high- and low-pressure steam, water, gas, air, and electrical lines. There are no overhead lines in this plant despite the fact it contains some 30-odd buildings spread over 104 acres of ground. All distribution lines in the tunnel are of welded-joint construction.

From the liquid distribution lines in the loop, taps are taken off through similar tunnels which branch off into the various buildings. All tunneling is illuminated by vapor-proof lamps, kept lighted 24 hours a day. Tunnels are inspected daily for leaking pipes or other defects.

The control of distribution of the

solvents is centered at the tank farm. At ground level directly above the vault containing the solvent tanks is a single-story brick meter house in which are located all meters, valves, and operating controls for the motor-driven pumps. Pumps are of 20-g.p.m. capacity. A structural iron stairway, with an intermediate observation platform, leads from the meter house down to the tank pit. Two meters are provided for each tank, one of the remote-reading, liquid-level type to show tank contents, and the other of the temperature-compensated, measuring type, in the outlet line, to show how much is being disbursed. Other apparatus includes a pressure gage and thermometer for each line.

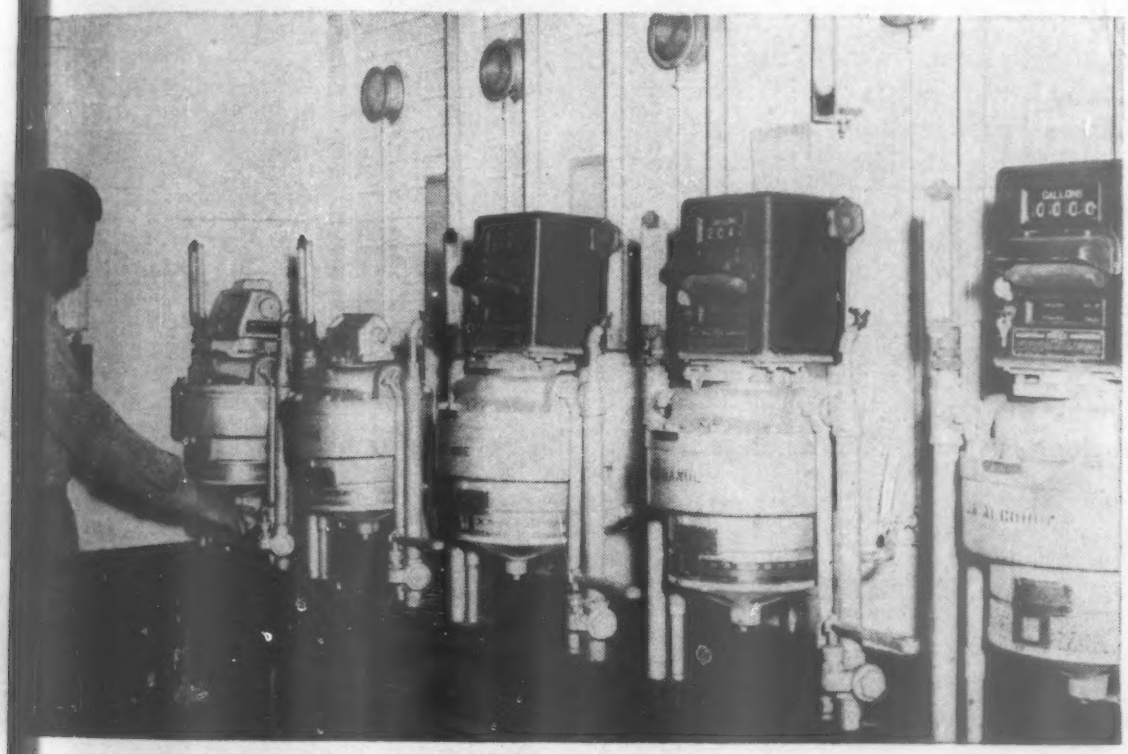
Here is how the installation functions. A telephone call is received by the meter-house attendant from a manufacturing chemist, say in building 28, who orders 500 gallons of acetone. The chemist opens the valve at his end of the acetone supply line emptying into a storage tank or process vat, whichever he proposes. The attendant takes a meter reading in the meter house, opens acetone-line valve, starts pump, and finally closes the valve when the meter shows the quantity ordered has been pumped through. When the flow has stopped, the chemist closes the valve at his end. That's all there is to it except stopping the pump until the next order arrives.

There are on the average six departmental outlets for each solvent line. An inexpensive water-type meter is installed at every outlet for the chemist to check the quantity delivered and for process control.

All telephonic orders to the meter house are confirmed by written regulations. The attendant maintains a daily log for each solvent tank showing receipts and disbursements, and the balances are checked daily with the liquid-level readings. When the system was installed, the amount put into the lines was charged off. There are no evaporation losses. Shrinkages on volatiles are regularly accounted for. This same type of inventory control is useful for all other chemicals disbursed from the tank farm.

The method of distribution of liquids from the aboveground tanks varies according to the kinds and amounts used. Solvents are routed through the meter house. In the case of the larger tanks holding hydrochloric and sulphuric acids, caustic soda, and bleach, a similar arrangement of individual centrifugal pumps and distribution lines through the underground loop is used to deliver these chemicals to about ten separate buildings. Materials for tanks, valves, pumps, piping, etc., are chosen for their corrosion-resistant properties to the chemical being handled, and maintenance does not constitute a serious problem.

Distribution pumps for the aboveground tanks are located near the storage tanks, but they have dual controls, one at the tank farm and the other in the building, so that they can be shut off at either place. There are no meters in these lines. Quantities are metered by receiving tanks in the buildings. However, no chemical can be drawn until a control valve in the line at the tank farm is opened. This valve is kept closed at all other times, both for reasons of safety and as an indication of whether or not any line is in use. All such valves are checked both morning and evening.



On one side of meter house are located the meters and valves for controlling the amount of flow of solvents pumped to any destination. Pressure gages show when lines are open or closed, and remote-reading, liquid-level type meters give inventory check on tank contents

SMALL-LOT DELIVERIES

Whenever small lots of chemicals are wanted by a non-manufacturing department or laboratory, they are doled out from the storage tanks into drums or carboys by the two men who operate the tank farm. Delivery to any department is made by personnel of the stockroom. If deliveries of chemicals customarily handled this way begin to run heavy, and a study indicates a continuing heavy demand for use in production, the economy of a new distribution line becomes justified, and it is added.

The tank farm is constantly expanding its facilities to meet added requirements for new chemicals or increased volume. As many as seven tank cars of liquids have been capably handled in one day. Labor to handle some 30 different kinds and strengths of chemicals both in small and huge quantities has been reduced to a minimum. But perhaps the tank farm has proved of greatest value in its provision of facilities for adequate and efficient storage and distribution of raw materials to assure uninterrupted production.

DEMOCRATIC CAPITALISM IS WORTH FIGHTING FOR

CLARENCE FRANCIS • CHAIRMAN OF THE BOARD, GENERAL FOODS CORPORATION, NEW YORK

As an American I am personally grateful that I have always been able to choose my own occupation, go where I please, vote as I please, and speak as I please. I am equally glad that anybody I know can look me in the eye and tell me to go to blazes if he doesn't agree with me. That represents a generally good state of affairs.

Still we must recognize that the whole of humanity is looking for something better than it has. Torn between terror and hope, the world is groping for Utopia.

The Chinese peasant, after centuries of slumber, embraces the communist vision held forth in Russia. Staid old England experiments with socialism. Even in America, the polls tell us, four out of ten persons lean definitely toward some form of basic change.

Now this yearning for the perfect state, as a trend, is better by far than despair. We know that "Utopia" can't be realized overnight. But we can be glad that *hope* is astir in the world. We cannot quarrel with the *goals* of revolutionaries if human betterment is their aim.

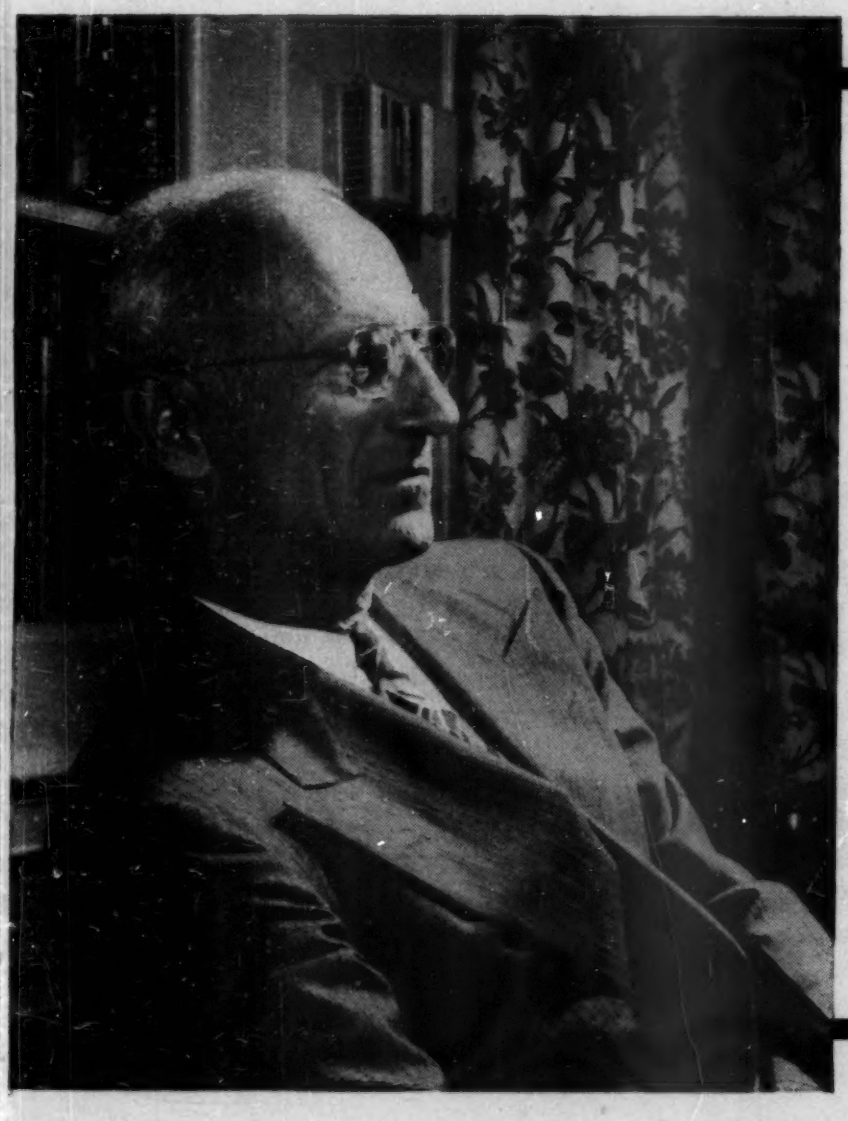
The question is: Which way to Utopia—or at least to a better world—right or left? Let us look at the signposts.

To the right lies democratic capitalism, the system we have in America. By this I mean a system based on the belief that the government exists to *serve* the citizen. Under this system, the tools of production are owned and operated by individuals or groups of individuals. The citizen is free to go where he pleases, work where he pleases, and profit from his work.

The journey to the left takes us toward "collectivism." By this I mean any and all of the communist, fascist, and other totalitarian proposals which place the *government first,* the man second. The government owns the tools of production. The government is the only "boss." It tells the citizen where to go, where to work, and for how much.

Whatever its failures, democratic capitalism offers the citizen a chance to speak his mind. Whatever its claims, collectivism demands an antlike, unquestioning obedience of its subjects.

Democratic capitalism is, to me,



You've heard many a junior executive say that the boss works harder than anyone else in the place.

In the case of Clarence Francis, chairman of the board of General Foods, it certainly seems to be true. For 36 years he has been working at "prune peddling," as he calls it, while handling scores of other jobs on the side.

After working his way through Amherst College, Francis started as a sales clerk for the Corn Products Refining Company in 1910. Step by step he came up through the sales organization until, in 1924, he joined General Foods as domestic sales manager for Postum. By 1927 he was president of Post Products; by 1935, president of General Foods.

Since 1933 he has served as adviser or executive of ten major governmental activities; he is a director or trustee of ten companies or institutions; he is an active member of almost as many more clubs or civic institutions in and around his hometown, Bronxville, N. Y. He has even been a deputy sheriff of Westchester County.

the hope of the world—materially and spiritually. I do not say that we have brought it anywhere near to perfection in America. But I do believe that it has done more, and can do still more, for more people than any other system.

No one of us is "free" in any anarchistic sense, of course. We all have obligations to face and critics to please. But those of us who are engaged in industrial production, for example, fare much better than those doing similar work in collectivist countries. Our successes are pretty well rewarded. We pay for our failures but we are not shot or "purged" or clapped into concentration camps. Certainly, I should hate to have the power—which collectivism seems to confer on individuals—to recommend that such things be done to any man, just as I should hate to have any man hold that power over me.

But that's on the negative side. Viewed positively, democratic capitalism has hardly glimpsed its own future. Already it has provided Americans—7 per cent of the earth's population—with 33 per cent of all the railroads, 45 per cent of all the radios, 50 per cent of all the telephones, and 70 per cent of all the automobiles in the world.

BEST OF EVERYTHING

These are the *direct* products of freedom to build, to own, to create, and to profit. As a byproduct, this free economy has generated enough taxable wealth to provide the best schools, hospitals, churches, museums, libraries, and universities in the world. Further, in the war years, both our productive capacity and our population have increased. This has created conditions under which our living standards can be raised much higher.

Let us, therefore, take a new view of our own possibilities. Cannot democratic capitalism spread its benefits far beyond the borders of America? We make more, use more, and have more to spare than any other people. Why? Because we own more of the tools of production. It is no accident that even the British industrial worker gets only about half as much money and can buy with that money only about half as much goods as the American worker. British investment in capital goods is about half that of the United States. That seems to me significant. So does this: The 13 million people of industrialized Canada purchase more United States goods than the 130 million people of non-industrialized South America.

These facts seem to me to suggest a kind of Utopia that can be realized. It begins with an American economy so strong and so free that it can really help to put the world on a paying basis. I believe that a way can, must, and will be found to place more of the tools of production in the hands of the "have-nots." Then they will be able to make more, use more, and *buy* more—at a profit to themselves and to us.

Here is a basic example: An Oriental coolie toils endlessly with crude tools for an income equivalent to $30 a year. That is all he can get no matter how hard he works. Could not his purchasing power be multiplied quickly by a single, simple farm implement? And would that not pay for itself quickly out of the worker's increased power to earn—in other words, out of his profits?

I *do* mean profits, by the way. I *don't* mean pouring gifts into a bottomless pit of non-productive poverty. No lasting good can come of sending finished goods to people who can't possibly pay for them. Better living standards can come only through *production.* People can pay for their own purchasing power with the right combination of tools—and willingness to work.

Have I oversimplified the case? Probably. But I don't think I have overstated it. For I think that, by helping others to help themselves, we can find *the real key to lasting prosperity and world peace.*

But our own creative, productive, industrial machine must first be kept strong and free. For this reason, I regard industrial management not simply as a way of making a living but as a real mission with a valid ideal. Hence I am startled when I realize that some of my neighbors would gladly do away with me and the system I represent. They, too, visualize Utopia. But they have an ear for collectivist siren songs.

Why? Well, the collectivist is selling a rose-tinted dream while I am advocating a reality with visible flaws. Any reality can be found wanting in contrast with a dream. Moreover, democratic capitalism wasn't "invented." It evolved and is still evolving. It has never had a Messiah or a prophet, a Karl Marx or a Hitler to arouse men's minds.

Further, the collectivist has at his disposal three potent appeals to the human emotion—fear, hatred, and hope. You and I want no part of fear or hatred. It is on hope, and hope alone, that democratic capitalism rests its case.

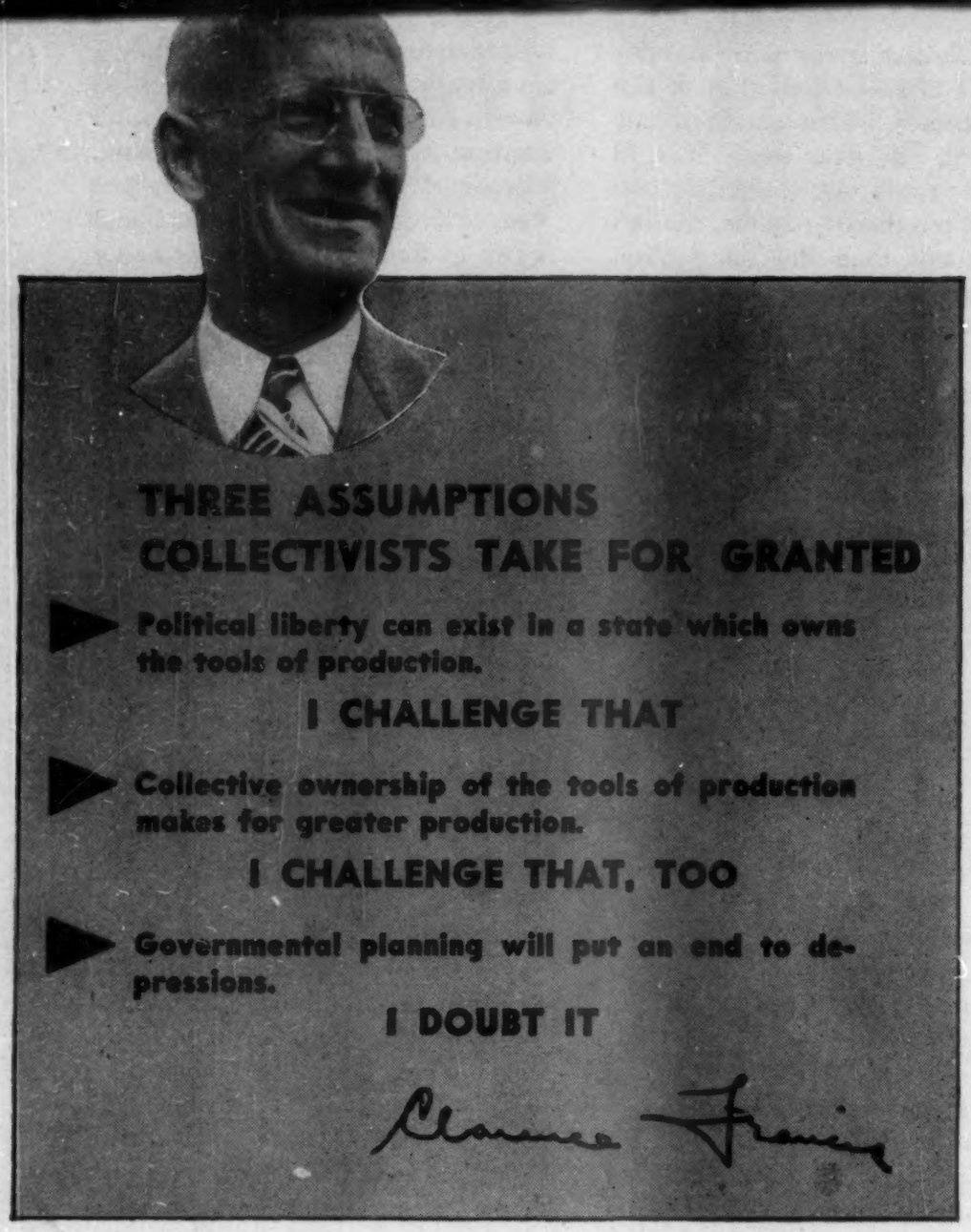
The collectivist, however, has a Robin Hood complex. He begins by promising to take something away from somebody and give to somebody else. He is meanwhile teaching his hearers to hate. Marx taught hatred of "capitalistic oppressors." Hitler taught hatred of the Jews. The Japanese militarists taught hatred of Occidentals. And all three made golden promises.

Now the collectivism of Hitler and Tojo was nationalistic. The collectivism of Marx is, in one sense, world-wide. But the communists hold no copyright on agitation. Native notions—"share the wealth," "ham and eggs," and so forth—have made an impression on Americans also.

Thus our system has been under heavy attack at many points. This caused us to look at ourselves critically and has put us on the defensive. Now critical self-examination is the source of all progress. We shall engage in some of it presently ourselves. But let's avoid being defensive. We are talking about a *system* that is more important than ourselves. It is worthy of our most aggressive support. So let us take the offensive instead. Let us attack the views of some of our attackers. Let us examine three basic assumptions which the collectivists seem to take for granted:

1. The collectivists say: *Political liberty can exist in a state which owns the tools of production.* I challenge that! When a man's livelihood depends on his political connections, he is inclined to sacrifice his freedom in order to eat.

Admittedly, certain common services, such as police and fire protection, mass education, and


THREE ASSUMPTIONS
COLLECTIVISTS TAKE FOR GRANTED
Political liberty can exist in a state which owns the tools of production.
I CHALLENGE THAT
Collective ownership of the tools of production makes for greater production.
I CHALLENGE THAT, TOO
Governmental planning will put an end to depressions.
I DOUBT IT

garbage collection are best provided by government. The government's personnel are sometimes influenced by politics in these areas. But they enjoy a relative freedom as long as the economy surrounding them is free. Suppose, however, that the government were to own and operate the nation's industrial plants. Management and its employees would then, sooner or later, be civil servants.

How long after that would it be before every job in any plant depended on allegiance to the local political boss and his higher bosses at the federal level? The temptations of such power would, I fear, be too much for mere mortals to resist. And how long would we have freedom of speech if those who disagreed with the ruling powers could be punished by the loss of their jobs?

2. The collectivists say: *Collective ownership of the tools of production makes for greater production.* I challenge that too! Bureaucracy throttles production, discourages initiative, and rewards inertia. I think it could be shown that most of our worst wartime examples of industrial inefficiency were found in plants where government ownership, or conditions closely resembling it, prevailed.

In Hitler's "planned economy," for that matter, 15 per cent of the civilian manpower was expended on government paperwork. Apply this to a fully employed American labor force of 56,000,000 and you would have a government army of 8,400,000 to supervise and control the economy. Most of these millions wouldn't add one thumbtack to the sum total of production—and they would cost a lot to carry.

3. The collectivists say: *Governmental planning will put an end to depressions.* I doubt it. What superman will do the planning—and what superman will carry it into effect?

Collectivist government, in practice, comes down to one-man rule. Remembering Napoleon and Hitler and all the mistakes of history, I don't believe any man can be all-wise or absolute. Believe me, I am glad that all the mistakes I have made aren't known to any single person. I should hate to attend a convention of all the people who know of some—but not all—of my mistakes.

Frankly, I don't believe in the all-wise man. All my best decisions, at any rate, were made with the aid of other people. And I should always prefer to see people thinking together, making some mistakes together, and arriving at generally correct decisions together. I hope that some day a lot of people will think through to a solution of economic cycles and world depressions. I see no evidence that "planned" economies have found the answer.

So much for the collectivist's ideas. I realize that I have disposed of some highly debatable subjects here in a very few words. Many books have been written, pro and con, on collectivism's effect on freedom. I have simply given you my views.

Now let us consider the strengths and weaknesses of democratic capitalism as we know it.

One of the foremost criticisms of our system—and one of the hardest to answer—is that of instability of production and employment. We have rejoiced in many "booms" while dreading many "busts." The higher the living standard, the more sensitive is the economy to the unpredictable variations of consumer demand. Our national living standard is high. Our industries make many things that people don't *have* to buy. Consequently, purchases, production, and employment are bound to vary.

We can't undertake to *make* consumers buy on schedule. Neither can we afford to fold our hands and sigh over the idea that layoffs are "inevitable." Management pioneers have shown that seasonal unemployment is *not* inevitable in many lines, and that production and employment can be stabilized and even guaranteed over long periods.

This does not apply to all industries. Perhaps it never will. But every management has a duty to make work as steady as possible.

Production and sales can be more closely related. New products can be developed and fitted into existing production. Inventories can be built in slack seasons. All this is not just a matter of helping others. It is good business.

This is part of the broad new philosophy which will govern modern management in all its policies. The basic elements of this philosophy consist of four principles:

First Principle: *Operation in the public interest.* Capitalism in its first form was called "laissez faire," a fancy French way of saying: "Let the owners of industry alone—don't bother them with any kind of regulation or responsibility." The "laissez faire" capitalists of the 19th century were great builders; they built "better than they knew," perhaps. But, with few exceptions, they were indifferent to the welfare of employees and public. They were simply after profits.

Today most managements recognize responsibility to three groups—employees, stockholders, and the public. The pendulum had to swing hard against industry before this new attitude took hold. Personally I don't think the change came about solely through public pressure, however. Much was due, I believe, to the common-sense thinking of latter-day management men. They know that they are "hired" by one large group of people, the stockholders, to direct another large group of people, employees, in the service of *all* the people.

At all events, management can go still further in identifying its policies with the public interest. Industrial teamwork is the true ideal, with government as the "referee" when disputes arise. Much government regulation has been necessary and desirable.

By approaching regulation objectively, management earns the right to be heard when it opposes the things that really threaten freedom. By acting voluntarily to correct abuses, it robs its critics of their points.

Second Principle: *Competitive efficiency.* The true source of our industrial greatness lies, I think, in the fact that Americans are free to vote, free in their jobs, and free to better themselves. Our industries operate under the spur of the profit motive. They have an incentive to grow and to become more efficient. Above all, production is both increased and regulated by *competition.*

Could anything be more democratic than the fact that consumers possess the power to vote us out of business by simply refusing to buy? Every day is Election Day for industry. And every effort to fix prices or restrain production is a denial of a great principle.

We have every reason to guard and improve our competitive efficiency as we would any other precious asset. This is partly a matter of methods, techniques, and equipment. But the winning factor is the *human* factor.

Third Principle: *The human factor.* Good personnel administration is too big a subject for detailed discussion here. Its activities and its benefits are almost too many to name. They certainly amount to more, much more, than the fair negotiation of wages, hours and working conditions which the law and common sense alike require.

I propose these questions as a test of good personnel administration:

1. Has management done the things it can do to make people *want* to work?

2. Have employees been given every possible reason—from their own point of view—to feel a sense of personal dignity, security, and participation in the enterprise and in our industrial system?

There may never come a day when any management can honestly say that it has done everything possible in these respects. But there should never *be* a day when it hasn't *tried.* We are speaking here of the key to productive teamwork, the real road to the increased man-hour productivity so sorely needed today. And we are speaking also of management's broader role in democratic capitalism.

Fourth Principle: *Leadership.* The management of modern enterprise calls for the courage to build, plan, create, and expand—and thus to keep the confidence of employees and public. It calls for the courage to imagine constantly greater markets, better products, and larger rewards. It calls for the capacity to recognize the part a strong America can play in the greater service not only of 140,000,000 domestic consumers but of 2,000,000,000 potential customers beyond our borders.

It calls also for the courage to make facts known and, on occasion, to fight. We cannot expect to be understood if we do not keep employees, stockholders, and consumers informed. If ever we let unfair attacks go unanswered, we should give ourselves good reasons for our silence. We must be prepared to "take it on the chin" whenever principle is concerned. Policy can be compromised and adjusted—principle never.

It calls, in other words, for a quality of leadership that is not only technically excellent but human.

Now you may say: Well, a corporation official *should* believe in democratic capitalism. A bishop should believe in religion. Yes, but I am speaking of what I have *seen* as much as what I have experienced. Our system, to repeat, is not a dream; it has fulfilled millions of dreams and can fulfill millions more.

If we had never heard of democratic capitalism, and if some prophet were to proclaim it tomorrow, it would win millions of followers overnight. Lacking a prophet, we need a new faith in ourselves. Freedom, after all, is new. The great mass of men in every age have lived—and still do—in poverty and slavery. We in industry are working in the service of an ideal. We are creating jobs—not for "employees" but for *people.* We are making goods and satisfaction—not for anonymous "consumers" but for human beings. We are working not simply for production but for human liberty. Much will depend on how well we do our jobs.

In the war, all the elements of our economy succeeded largely in forgetting their selfish interests to work together for victory. Today we need a new national determination to achieve "total peace." Our only real enemies are indolence, suspicion, and greed. If we must fight, let's fight them—and work together, not toward a distant, impossible Utopia but toward the prosperity and peace within our reach. Let's make the most of the system we *know.* Let's make democratic capitalism work!

It's "town hall meeting tonight" at Whiting Corporation. Company management, with nine years of successful experience, recommends the technique to other plants anxious to lay a firm foundation for good industrial relations. Meetings are conducted in the best New England tradition. Company invites constructive criticism and suggestions, gets both from an interested audience

TOWN HALL MEETINGS FOR BETTER HUMAN RELATIONS

STEVENS H. HAMMOND • PRESIDENT, WHITING CORPORATION, HARVEY, ILL.

Monthly discussion groups provide the mechanics by which Whiting management tells employees what's on its mind—and finds out what's on theirs. Known as "Town Hall Meetings," and conducted in the best New England tradition with management and workers firing away at targets of mutual and individual interest, these regular gatherings have, in the nine years since their inception, brought about significant advances in the ability of employee and employer to find better ways of working together.

The development of Town Hall at Whiting was a product of necessity. In earlier years contact with workers was direct. The boss could recognize an employee and call him by his first name. But like so many good things this intimacy diminished as operations were expanded.

WHY TOWN HALL

- To generate a feeling of unity
- To make company problems known to all employees
- To utilize the thinking of all in solving company problems
- To clarify responsibility of individual to group — and of group to individual
- To assure fair play to everyone

As the company prospered and grew in size and complexity, there developed the threat of an ever-growing gap between top management and the men and women at their machines and desks. It was believed and hoped that employees would accept Town Hall as their own and thus help perpetuate effective machinery for maintaining personal contact between employee and employer. This expectation has been fulfilled.

PURPOSE OF MEETINGS

The first meeting was held in 1937. Approximately 150 employees, selected at random, were invited. In this meeting the purpose of future assemblies was outlined.

Participants can and do raise any question without fear of criticism. Personal issues are kept in the background, but they have never been barred from discussion, and they have been aired on several occasions. The company has repeatedly invited constructive criticism

TOWN MEETING IN SESSION. AUTHOR, AS MODERATOR, TAKES QUESTION FROM FLOOR. ANYONE CAN ASK ANY QUESTION ANY TIME

and suggestions. Aside from kidding he may have received from fellow-workers, no employee has ever been disciplined or suffered discrimination for anything he has said or done in a town hall meeting.

MANAGEMENT REPORTS

Management periodically makes a complete report to its employees regarding over-all operation, usually once each month.

As much detail is given as time and conditions permit. All facts are presented, regardless of whether or not they hurt. Monthly profit-and-loss statements are scrutinized, and, when necessary, reasons for losses are examined in considerable detail. It is felt that employees participating in the analysis of the business will better realize what part they play in determining their own security and rates of pay and also see the larger picture of mutual responsibilities.

Additional topics presented for consideration are company policies, new products, and changes in methods of operation. Safety is frequently an important subject. Popular parts of the meetings are announcements, and presentations for suggestion system awards and for long-time service.

Changes are made in the Town Hall program to make it fit the times and conditions. Night shift employees have special meetings. New employees are invited to the first scheduled meeting after their employment, and are introduced to the group in attendance.

A method of widening the influence of the forum has been found in the practice of mailing a transcript of meeting minutes to the homes of employees. Family members are often more interested in these reports than are some employees, and they are quick to spread good company news to the community. Home readers and home rooters are a recognized and important audience of the company's industrial relations program.

QUESTIONNAIRE

With a recent mailing of minutes, a questionnaire was included. The answers are helping Town Hall keep abreast of new needs.

"Do you attend Town Hall whenever invited?" The replies were unanimously in the affirmative, except for the employee away from the plant on meeting days.

"Do you feel that Town Hall gives you a closer relationship with management?" Replies were again unanimously in the affirmative. Also, 92.8 per cent believed that "management gave them the true and complete facts on subjects discussed." And 60.7 per cent felt that their problems could be settled in Town Hall.

Replies to the questionnaires rate subject popularity in the following order:

1. New Whiting policies or changes in policies.
2. Future plans.
3. Profit-and-loss figures.
4. New products.
5. Facts on job costs.
6. Details on operating expense.
7. World and national events affecting Whiting.

Suggestions were sought for stimulating more interest in the Town Hall program and, particularly, to encourage more discussion.

As a result of the recommendations received, the following changes are contemplated:

Separate meetings will be held for the supervisors and for the rank and file, but both gatherings will probably be held on the same day.

All future invitations to the meetings will include an announcement of topic or topics to be discussed.

Announcement of company policies and discussion of future plans or new products will be continued, and more time will be spent on details of job costs, expenses, and profits and losses.

STORAGE ON WHEELS CUTS HANDLING COSTS 75 PER CENT

L. T. McNEAL • PLANT AND PROCESS ENGINEER, WHITE SEWING MACHINE CORPORATION, CLEVELAND

Storage on wheels means a 75 per cent saving for White in the cost of handling raw lumber. From $8.44 per 1000 board feet in 1941 to approximately $2 in 1946, is the way the record reads. One manual handling operation has now replaced the six moves formerly required between boxcar and first planing operation. And, in the bargain, the amount of lumber that it is necessary for the company to keep in the yard is one-ninth the old figure.

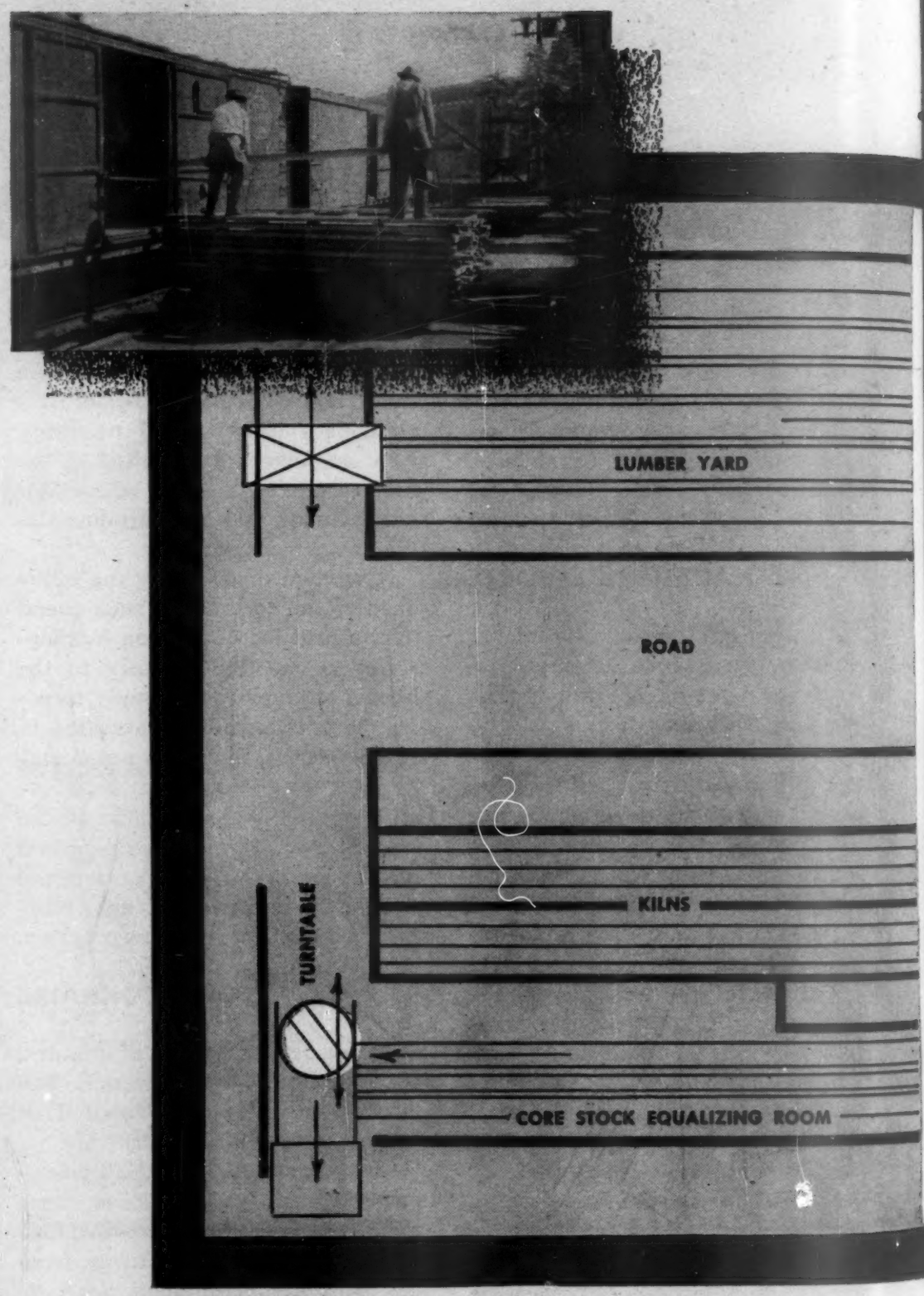
Prior to the installation of new facilities, the company stored some 9,000,000 board feet of lumber in a 6-acre yard adjoining the plant. This lumber was air dried in the yard for approximately four months. Six separate handlings were required. Kiln drying was done in a building removed from the cabinet production plant, and this necessitated extra hauling.

The revamped system utilizes a new 2½-acre yard adjoining a new set of kilns and equalizing rooms, which are on the first floor of the cabinet production building. The yard contains 1,000,000 board feet of solid and core stock, approximately 15 days' supply.

Just one loading and unloading operation is now necessary. Raw lumber is removed from a boxcar, and 7000-b.-ft. loads are piled on specially designed kiln cars. Cars consist of four two-wheel metal buggies connected by six bunkers, or strips, placed across the buggies.

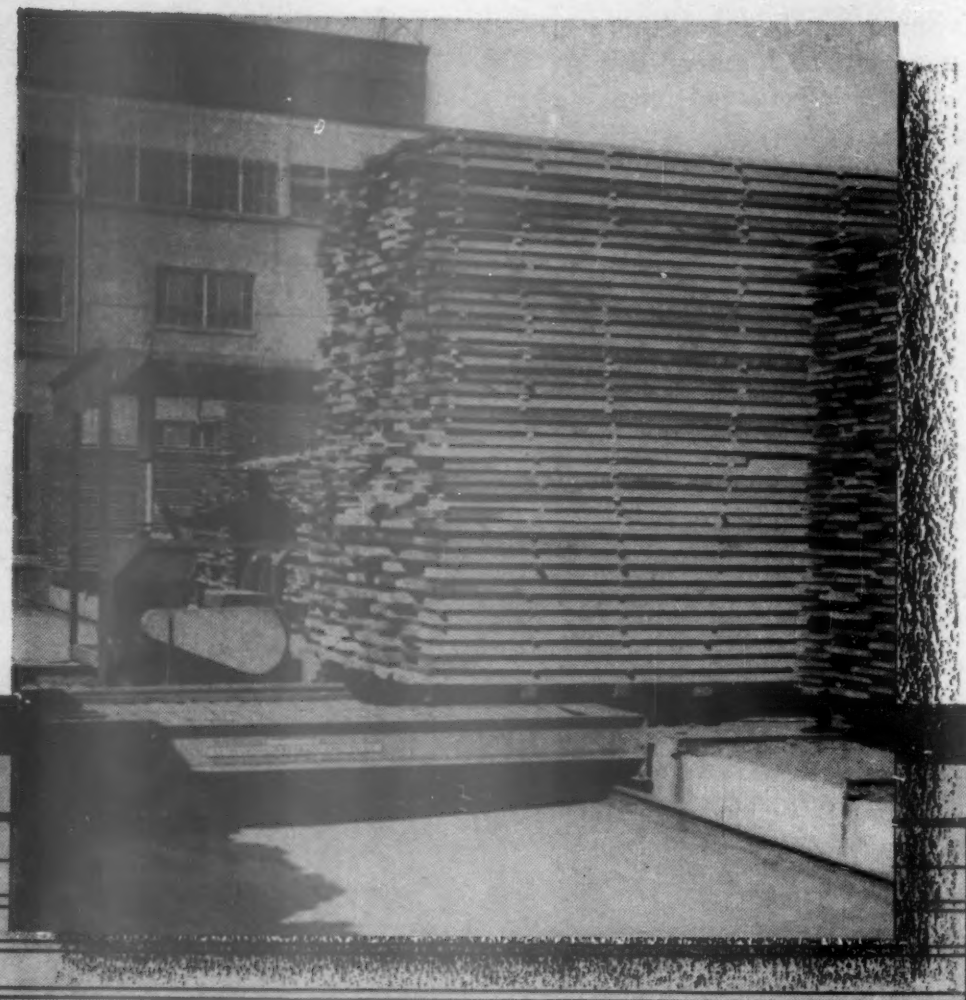
Lumber remains on the kiln cars in the yard until it is to be kiln dried. Then the car is pulled onto a power transfer car, which takes the car into the kiln drying chamber. In the kiln room there are two double kilns, which hold a total of 20 (7000-b.-ft. capacity) carloads.

When the desired moisture con-

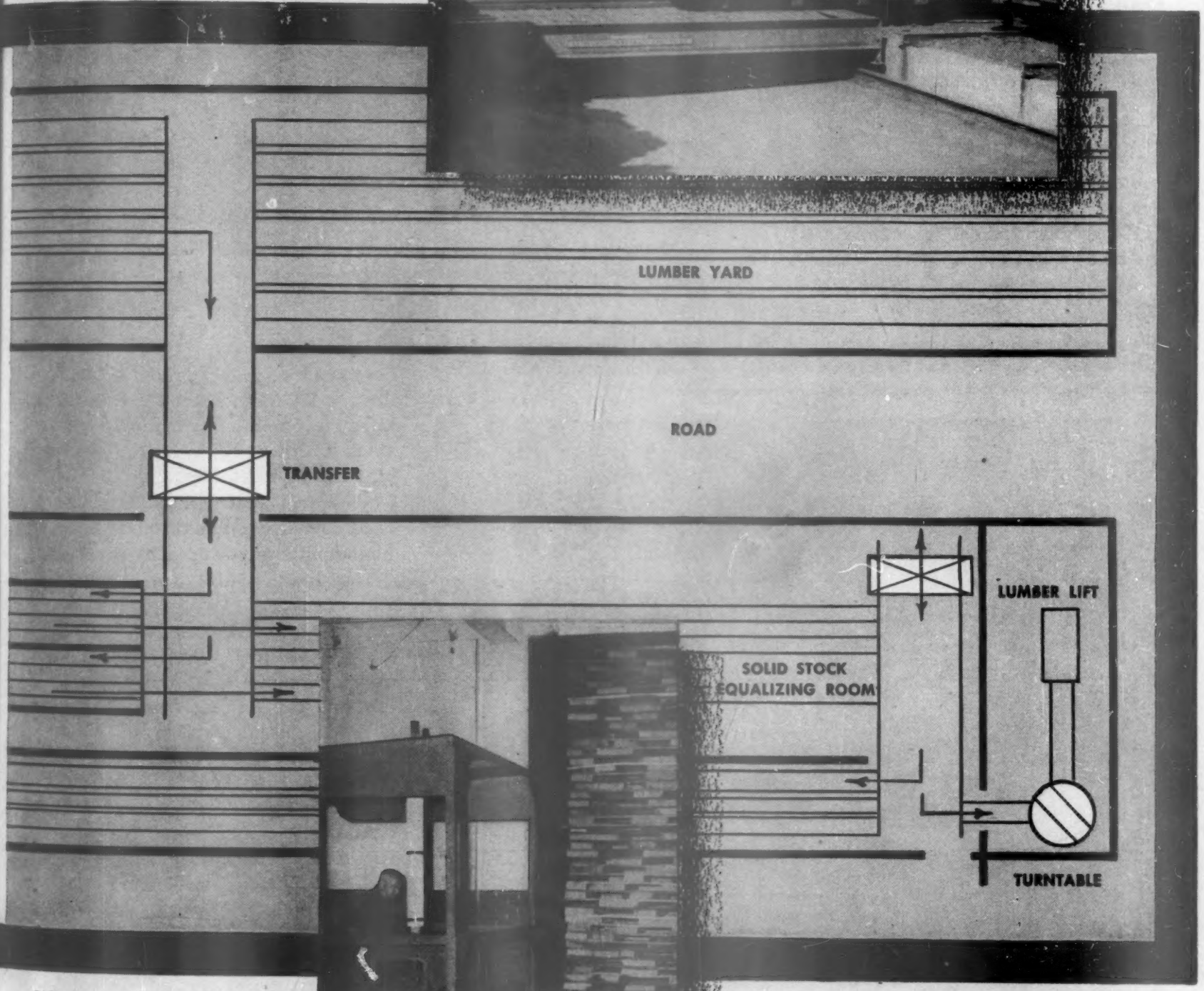


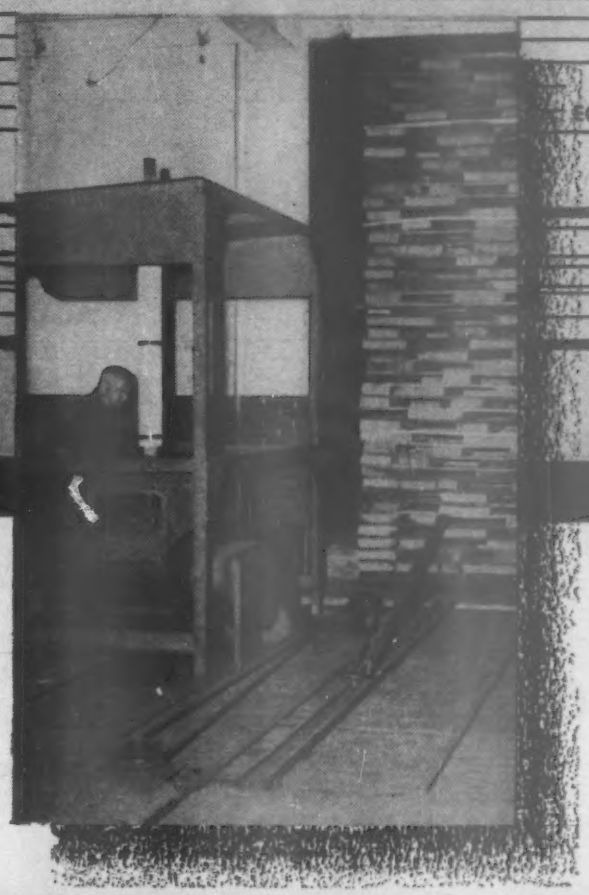
Kilns and equalizing rooms, which are on the first floor of the cabinet production building, adjoin a 2½-acre lumber yard. The sketch above illustrates how lumber is transported from yard to processing. A drop in levels between the different lumber seasoning steps enables all the conveying to be done by gravity

Only hand loading operation required is this transfer of lumber from boxcar to specially designed kiln car, which has been moved to loading position on a transfer buggy (See photograph on opposite page)



Transfer buggy pulls loaded kiln car from storage area and takes it to kiln chamber





Winch arrangement on the transfer buggy pushes the kiln car into the kiln

CONTINUED ON NEXT PAGE

tent (approximately 4 per cent) has been reached, the lumber—still on the kiln car—is removed from the kiln to an equalizing room. One equalizing room, directly in front of the kiln, holds approximately 150,000 board feet of solid stock. The other equalizing room is used for core stock, and holds approximately 350,000 board feet.

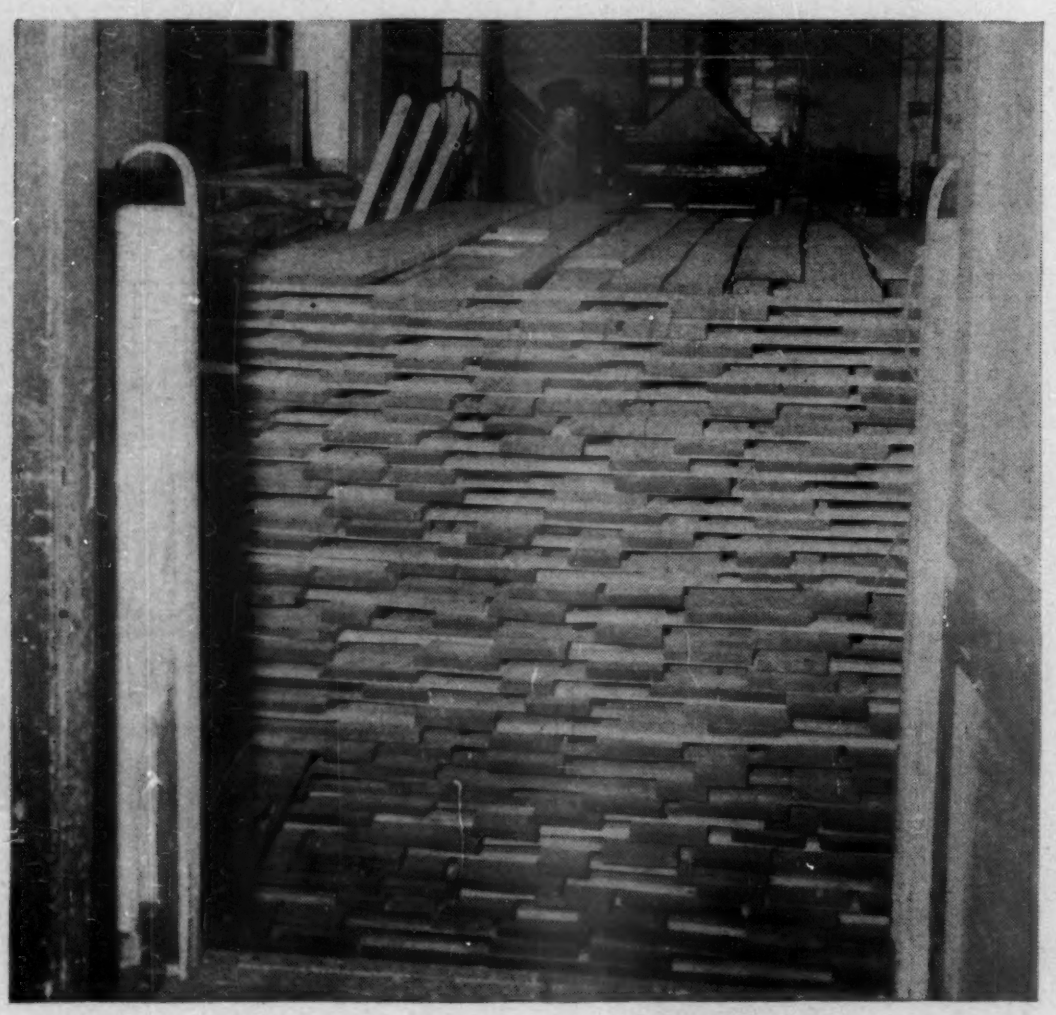
Stock remains in the equalizing room 5 to 7 days, and is held at 75 deg. F with relative humidity maintained at 35 per cent. Moisture content is equalized at 6½ per cent.

When solid stock is required for production, a kiln car is pulled from the equalizing room onto a transfer car and then transferred to a turntable. From the turntable the load is pulled into a lumber lift, which raises the lumber to the first solid stock planing operation. Core stock is handled in a similar manner.

From the kilns to the first transfer car through the solid stock equalizing room, there is a 6-in. drop in 65 feet. Through the length of the run for transfer cars, there is a 4-in. drop in 90 feet. Through the core stock equalizing room a 14-in. drop in 190 feet. From the transfer buggy through the turntable to solid stock lift, there are two drops—one of 2 inches in 24 feet, the other of 3 inches in 40 feet. Thus all handling of lumber from kilns through to the lumber lifts is powered by gravity.

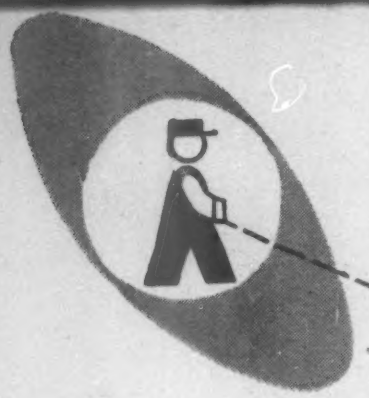
From the kiln, lumber load is taken to equalizing room. Here the load is shown, after equalizing process, being pulled onto a turntable, which transfers it to a self-leveling lift

The planer operator feeds lumber directly from the load to the planer. A self-leveling arm automatically keeps the top of the load on a working level with the planer bed. At left is a small lift arrangement into which the operator discards spacers



The lumber lifts are designed with automatic leveling stops, so that the top of the lumber pile is always level with the operating bed of the planer. Thus the operator can pull the lumber from the top of the load at machine level. When the top level of the lumber falls below the planer beds, the leveling arm automatically raises the lift.

Approximately 11 days' full production of stock is processed in kilns and equalizing rooms. The actual capacity is 682,000 board feet, consisting of 140,000 feet in the kilns, 150,000 feet in the solid stock equalizing runs, 28,000 feet on the solid stock turntable and lift. These amounts, plus the 15 days' stock kept in the lumber yard, provide for approximately 26 days' supply of lumber.



Looking Ahead in Labor

last-minute round-up as we go to press . . .

Signs point to a willingness by organized labor to compromise second-round wage demands without strikes.

CIO strategy has changed. Forgotten are last year's battle cries. "52 for 40 or Fight!" Thirty per cent! Wartime pay for peacetime hours! What did they bring? Strikes, 18½-cent raises, shortages, higher prices, lost savings.

Today the tune is the same, but the tempo has changed. It is "substantial" wage increases CIO wants. AFL wants to look at production per man-hour, profits. No breast beating, no frenzy for strikes. No fixed position difficult to retreat from. Actually, employers offering "reasonable" raises may get off without strikes. Unions are thinking in terms of 10 to 15 per cent.

Publicly, CIO wants to convey the impression that the bite is on excessive profits only. Wage demands, it says, will vary according to what each industry's profits can stand, with profit positions of individual companies getting little attention.

Yet CIO auto workers almost simultaneously declared for 23.5 cents more, plus other demands, in an industry that lost money for most of 1946. CIO electrical workers bide their time, speak vaguely of "substantial" raises. So do the steel workers, other member of CIO's "big three."

As in the past, AFL wage settlements will largely reflect company and area conditions. They will follow no patterns.

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John L. Lewis having passed, it will be up to the CIO to play its hand. So keep your eye on Murray and his steel workers. This largest CIO union is holding the cards. It will fix the size of the pot for other unions in heavy industries.

Murray's steel workers picked up the check for the Nathan report (see page 97). This CIO-backed document contends that, without raising prices, manufacturing corporations can raise workers' "earnings" 21 per cent, still earn twice as much profits as in 1936-39.

Unlike last year, when Reuther jumped the gun with the strike against General Motors, CIO strategy today is united, carefully timed. It calls for Murray to lead the way in steel with a well-documented, carefully prepared case. Other CIO leaders feel he can make a better argument against the steel industry. Other CIO unions will then use the steel settlement as a lever.

There is a strike strategy behind the wage strategy. First big strike, if it comes, will be in basic steel. It will come only after the steel union has done a selling job on the public. First step in this direction was the Nathan report, sprung at a fancy luncheon press conference of more than 100 topnotch Washington byline writers.

If Murray can get public support for his wage demands, he will use the same arguments trying to justify a strike if necessary. A strike in basic steel probably would crimp automobile and electrical appliance output quicker than another coal stoppage. Once settled, the steel increase is likely to become the pattern in automobiles, electrical manufacturing, metal mining, and even coal mining.

Heavy industries will have a hard time avoiding strikes without matching the basic steel raise. However, fringe adjustments may offer a basis for granting less than steel. These include sick leave benefits, pensions, holiday pay, better vacations, etc.

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Concentrating on wage-rate increases, union leaders will forego actual signing of guaranteed annual wage plans at this time.

Wage settlements by Sinclair Oil and Dow Chemical reflect problems of the times, may provide solutions for other employers. Sinclair and CIO oil workers agreed on a quarterly cost-of-living bonus adjustment, the first one amounting to 18 cents an hour.

Dow Chemical, instead of meeting a 20-cent hourly wage increase demanded by District 50, UMW, will pay only enough more to satisfy portal pay requirements. This averages 11 cents an hour. Claims for retroactive adjustment were settled for $3,970,000.

Some relief from the avalanche of claims for portal-to-portal pay, both retroactive and future, may come from this Congress. One plan, included last year in the Gwynne Bill, would limit retroactive liability to one or two years. A clarification is also being sought of the Fair Labor Standards Act of 1938 (wage-hour law) so that employers may be fully aware at all times of their responsibilities under the law.

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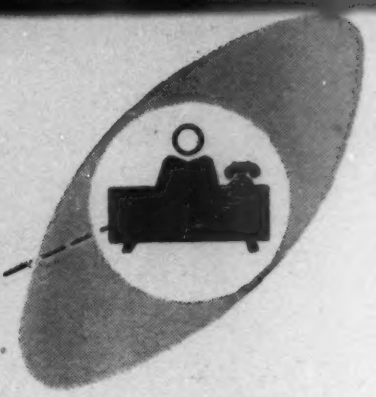
Mark this down. The Norris-LaGuardia Act will not apply in the future when the federal government is behind an injunction. If the Supreme Court holds Lewis was protected by the Act when he provoked his UMW to strike against the government last November, you can expect Congress to amend the law.

Looking Ahead in Business



last-minute round-up as we go to press . . .

For the first time in many a year, department stores ran pre-Christmas bargain sales to clear their shelves of hard-to-move merchandise. This is the tip-off to the end of the boom in many lines.

Stores piled up stocks to record heights last fall. And, because they confidently expected the biggest Christmas rush ever, they continued to order new merchandise from manufacturers in ever-increasing volume. End-of-October department store stocks were 40 per cent above a year ago and new orders were up 20 per cent.

Christmas shoppers jammed store aisles and poured almost 25 per cent more dollars into store tills than in 1945. In New York, Macy's sales topped the million-a-day mark for several days in a row. But much of this increase was made up by higher prices, so unit volume was, if anything, only slightly above 1945.

Storekeepers had counted on a much bigger Christmas rush. So when sales lagged behind goals, many merchants slashed prices on over-priced goods and gave January bargains to Christmas shoppers. Furs, jewelry, and other luxuries were the first to be marked down. But many stores ran clearance sales on women's clothing, furniture, and even toys.

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What happened in furs may well be a forerunner of what will happen in other lines. When OPA went out the window, prices of luxury furs doubled; lower-priced furs went up 50 per cent. Unseasonably warm weather combined with buyer resistance to break the market, and retail prices were slashed by 50 per cent or more. The nation's largest fur operator petitioned for bankruptcy. Farm prices of fur pelts dropped 30-50 per cent. *There may be one ray of hope in the fur picture, however—prices have apparently hit bottom at a level well above pre-war.*

Fact that fur prices broke and that Christmas sales in some other lines failed to measure up to pre-season guesses is not particularly significant in the first instance—it means merely that merchants will make less money.

But it will be serious news, indeed, to many manufacturers if retailers begin canceling orders in a big way. And all the signs point to the fact that they will do just that in lines that are overpriced, or where quality has been low, or where consumers are turning thumbs down on unknown brands.

Consequently, the scene is set for an important readjustment in consumer spending that will affect manufacturers' sales. Sales of durable consumer goods will go on rising from $14 billion in 1946 to well over $20 billion next year if long-drawn-out strikes can be avoided. But sales of non-durables—food, clothing, tobacco, etc.—will decline from 1946's record $77 billion.

First signs of price weakening in food lines also appeared at Christmas time when butter and egg prices took a nosedive. But the drop started from near-record heights and prices pulled up short at levels that still look high by pre-war standards. Total food supplies will not be any larger than they are now before late spring, so there is little chance of major price declines for the next few months.

Prices of basic raw materials, on the other hand, are still on the upgrade. Major steelmakers are revising price lists upward to make up for higher freight and scrap charges. Copper and lead have risen spectacularly from the admittedly inadequate OPA ceiling prices. The BLS index of industrial raw materials prices is up more than 50 per cent from the level of a year ago.

Increases in prices of basic raw materials boost manufacturing costs and thus prices of industrial products. Another round of wage increases will also push industrial prices up.

For all these reasons, the price outlook is mixed. The days have passed when the only way prices could move was up. From now on, some prices will toboggan, some will weaken slightly, some will move sideways, and some will continue to rise.

This is to be expected. Prices can't rise forever. Big question is whether holiday developments signal the beginnings of a downturn in general price averages or merely the operations of a free market as consumers switch purchases from one line to another.

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That a downturn in prices and general business activity during 1947 is a distinct possibility is underlined by the first report of the President's Council of Economic Advisers, a report which is notable for its common-sense analysis of the problems of keeping our economic machine running full-blast. After reviewing all the favorable elements in the business outlook, the Council goes on to say: *"It is easy to visualize such a mishandling of our economic affairs as might make 1947 a year of curtailed production, irregular employment, and unsatisfactory purchasing power."*

FACTORY MANAGEMENT AND MAINTENANCE • Plant Operation Library No. 101 • January, 1947

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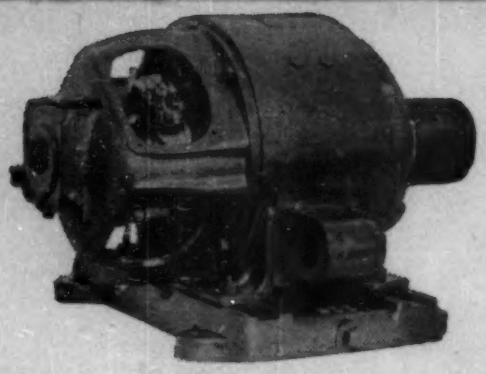
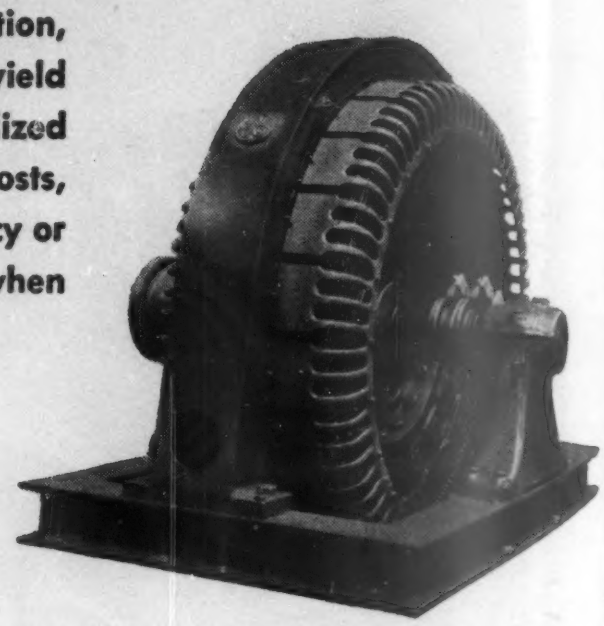
YOUR ELECTRIC MOTOR

HOW TO PICK IT AND HOW TO TREAT IT

J. F. MACPHEARSON • DISTRICT MOTOR SPECIALIST
GENERAL ELECTRIC COMPANY, DALLAS



The dollars invested in electric motors will yield maximum return only when the motors are carefully selected and applied, properly operated, and adequately maintained. It is not enough to consider only the initial cost; the cost of operation, maintenance, or replacement often influences investment yield more than the original cost. Indirect savings or profits realized through increased production, reduced manufacturing costs, simplified control, or power saving through higher efficiency or improvement in power factor, must be carefully weighed when selecting and applying motor drives.



CHECK POWER SUPPLY

Power Supply. Motors usually are selected to match the power supply. In most instances selection on this basis provides a satisfactory, economical installation. Since practically all central station power is alternating current, we shall be primarily concerned with a.c. motors.

In order to select a motor to match the power supply, its voltage, frequency, and number of phases are the first consideration. Next, the power rates or power contracts, voltage regulation, continuity of power, short-circuit current, and the possibility of voltage surges should be examined.

Voltage. If the voltage is sustained at less than 90 per cent or more than 110 per cent of the nameplate voltage, special motors and control may be required. Very large motors built to order usually are designed for the exact voltage to be maintained.

Table I indicates the preferred maximum and minimum horsepower limits for the different distribution voltages encountered and the corresponding motor voltages. The voltages underlined are standard, and general-purpose motors designed for these voltages usually are carried in stock.

Note that the nominal system voltage is higher than the corresponding standard motor voltage. Do not use nominal system voltage as a specified motor voltage unless absolutely necessary. A price addition for special voltage will be added to the normal price of the motor by most manufacturers.

Motors will operate at voltages between 90 and 110 per cent of the nameplate voltage, except in larger sizes where they are built to order. Those operating at voltages either lower or higher than the nameplate voltage have slightly modified characteristics. The common three-phase voltage for four-wire networks is 208 volts. Induction motors of 220-volt design, therefore, operate satisfactorily at 208 volts, although with modified characteristics.

Frequency. The power supply frequency is important, since the motor speed varies according to the formula:

$$r.p.m. = (f \times 60) \div n$$

where

$r.p.m.$ = synchronous speed
f = frequency in cycles per second
n = number of pairs of poles

An induction motor operates at slightly less than synchronous speed.

The frequency most commonly encountered is 60 cycles. Southern California and a few isolated systems, as well as most foreign countries, have 50-cycle systems. Forty- and 25-cycle systems are not numerous in this country, and motors for these frequencies are not nor-

mally carried in stock. Frequencies other than those mentioned usually must be obtained by means of induction frequency converters or alternators.

Number of Phases. Three-phase power, either three- or four-wire, is the most common as well as the most desirable. Most residential and rural distribution systems, however, offer only single-phase. Two-phase power is found only in a few scattered areas; therefore two-phase motors are not generally available in stock.

Since it is difficult to wind two-phase motors for multi-speed operation, it is usually advisable to transform two-phase to three-phase where multi-speed motors are indicated.

If an unexpected change in the direction of rotation would cause damage, check the power system for the likelihood of phase reversal. If such reversal seems strongly indicated, use phase-failure relays.

Power Rates. The power company's policies concerning energy rates, demand charges, and power factor penalties or bonuses ought to be examined when selecting a.c. motors. Higher motor efficiencies mean less operating cost at any energy rate, with other factors remaining the same. The savings, however, may not pay the added costs necessary to obtain the higher efficiency, particularly if the running time for the motor is comparatively short.

Also, if any sacrifice in power factor is made to gain higher efficiency, the savings may be nullified by penalties or loss of rate bonuses. Most rate schedules have a demand charge giving a rate based on the maximum demand in a given period of time, as well as the energy consumed. Proper choice of motors and control may smooth out the demand and lower the rate.

Efficiency and power factor usually are lower at loads below the nameplate rating. Proper selection to avoid over-motoring will result in lower operating costs. Several small motors may be more economical than one large one, if the full capacity of the larger motor is utilized only part of its running time.

Many rate schedules incorporate a power factor clause, adjusting the rate according to power factor. Others involve a penalty or bonus if power factor is, for example, below 80 per cent or above 90 per cent lagging. In larger sizes, synchronous motors have many advantages (to be mentioned later), one of the most important being their ability to operate near unity, or at leading power factor. This feature makes it possible to improve system power factors.

Alternating vs. Direct Current. Both a.c. and d.c. motors have advantages and disadvantages that vary with the application. Each has a field in which the other cannot compete. It is usually the borderline cases that prompt discussion.

For most applications a.c. motors are more satisfactory and economical, since adequate performance can be obtained by the use of proper motors and control. Where special characteristics, such as extra-wide speed range or severe accelerating or reversing duty, are involved, d.c. motors may be indicated, even where power conversion by means of motor-generator sets, rectifiers, or converters is necessary.

Torque characteristics that can be obtained only with difficulty, if at all, with a.c. motors are possible with d.c. motors. Controls for d.c. motors are almost always positive and simple, control currents are usually smaller, and the design is simpler.

Direct-current power is not always available, but must be converted from the existing supply. Because of this, and the fact that d.c. motors in general are more expensive to maintain than the a.c. type, the initial and service costs are higher. Where the operation of several motors must be coordinated, however, or indirect savings such as spoilage reduction and increased production are possible with the positive, accurate control of d.c. motors, their higher cost may be justified.

Table II shows the preferred maximum and minimum horsepower limits for different d.c. voltages.

Since voltage regulation, continuity of power, short-circuit current, and voltage surges affect both d.c. and a.c. motors, the following discussion of these aspects of power supply pertains to both types:

Voltage Regulation. This feature of the power supply

TABLE I.

PREFERRED HORSEPOWER LIMITS OF A.C. MOTORS FOR DIFFERENT DISTRIBUTION AND MOTOR VOLTAGES

Nominal System Voltage	Standard Motor Voltage	Minimum Horsepower	Maximum Horsepower
A. C., Single-Phase			
120	115	None	1½
240	230	None	10
480	–	5	10
600	–	5	–
A. C., Two- and Three-Phase			
120	110	None	15
120/208	220	None	200
240	220	None	200
480	440	None	500
600	550	None	500
2400	2300	50	None
4160	4000	75	None
6900	6600	400	None

TABLE II.

PREFERRED HORSEPOWER LIMITS OF D.C. MOTORS FOR DIFFERENT VOLTAGES

Voltage	Minimum Horsepower	Maximum Horsepower
115	None	30
230	None	200
550-600	½	None

must be known in order to select motors that will deliver sufficient torque, with the probable drop in voltage, to start and carry the load. It is particularly important with induction and synchronous motors, since their starting and pull-in torques vary as the voltage squared.

High starting currents may cause dips in the voltage of power circuits that will affect other apparatus. On combined light and power lines, a voltage drop of about 2 per cent (caused by high motor-starting currents) may cause objectionable light flicker. A drop of 6 per cent is sometimes permissible where starting is infrequent, say two or three starts per day.

Starting current can be varied through motor design or the use of proper control. Occasionally it may be necessary to select a motor design for low starting current and use current-limiting control as well. In general, a.c. induction motors with a squirrel-cage secondary have the highest starting current, whereas those with phase-wound secondaries have the lowest.

Because of the low armature resistance of d.c. motors, current-limiting control is almost always necessary. The high inrush current of d.c. motors usually prohibits full-voltage starting.

Power companies usually limit the starting current drawn by motors. Requirements on this point vary, and must be checked. Usually the total current is not limited, but it must be built up in steps or increments, the magnitude of each step being determined by the total connected load.

Motors that draw pulsating currents from the line, as when driving reciprocating pumps or compressors, may cause corresponding line voltage variations. Pulsation frequencies of 250 to 600 per minute may cause objectionable light flicker, even if the voltage variations are as small as 0.5 per cent. Pulsating loads driven by motors with speeds above 600 r.p.m., will seldom cause objectionable light flicker. The usual limit for current pulsations is 66 per cent of motor full-load current, although the system regulation may require a limit of 30 or 40 per cent to avoid light flicker.

Continuity of Power. Dips in voltage caused by switching or disturbances may necessitate time-delay undervoltage protection and, with synchronous motors, high-torque designs and resynchronizing control.

As mentioned, a.c. motor starting torques vary as the voltage squared. Sustained low voltage may necessitate higher-torque motors. With continuous processes where continuity of power is essential, standby power units or control for automatic transfer to another power source may be required.

Short-Circuit Current. The point of connection to the power system may necessitate high-interrupting-capacity controllers or additional fuses or breakers of high interrupting capacity, to handle the probable high short-circuit current.

Voltage Surges. When motors are supplied from high-voltage overhead power lines they may be subjected to high surges in voltage produced by lightning or switching and may require special insulation and possibly external protective equipment.

STUDY DRIVEN MACHINE

When selecting a motor to drive a certain machine, the speed, speed range and speed regulation, direction of rotation, power requirements, torque requirements, and the mechanical arrangement of the machine must be known. The inertia (WK^2) of the machine, thrust capacity, end-play limitations, balance requirements, frequency of starting, deceleration, operating schedule, and method of control also must be known, since they will have an influence on the type of motor and control selected.

Speed, Speed Range, and Regulation. Where more than one speed or a range of speeds is required, one of the types listed in Table III may be applicable. Motors marked with an asterisk have relatively wide speed regulation, which makes them unsuitable for some types of applications.

The maximum speed regulation (variation in speed with load) allowable by the requirements may vary from zero to a high percentage. With zero speed regulation, synchronous motors or special d.c. motors will be required.

Some driven machines have to operate in synchronism with others, thus requiring synchronous or d.c. motors, or selsyn equipments.

Direction of Rotation and Reversing. Most types of motors can be ordered for reversing operation. In such cases, a suitable reversing controller will be necessary. If the driven machine will be damaged by operation in the wrong direction, phase-reversal relays or reversing protection switches may be required.

Horsepower Requirements. The horsepower required by the driven machine determines the motor rating. Where the load varies with time, a horsepower-vs.-time curve will indicate the peak horsepower, which will indicate the proper motor rating from a heating standpoint. With extremely large variations in load, or where shutdown, accelerating, or decelerating periods constitute a large portion of the operating cycle, the r.m.s. horsepower may not give a true indication of the equivalent continuous load, and the motor manufacturer should be consulted.

Where the load is maintained at a constant value for an extended period (from 15 minutes to 2 hours, depending upon the motor size), the horsepower rating required will usually not be less than this constant value.

If the driven machine is to operate at more than one speed, the horsepower required at each speed must be determined.

Torques. The starting or breakaway torque required may be as low as 10 per cent or as high as 225 to 250 per cent of full-load torque. Breakaway torque may vary greatly on different motor types because of frequency of starting, temperature changes, and type and amount of lubricants. The motor torque at the shaft must be

well above the torque required by the machine, taking into consideration these variables, as well as the possibility of low voltage. The type of starter used may also influence the starting torque.

Torque required after breakaway for acceleration to full speed varies, remaining at a rather high value throughout acceleration for such machines as loaded compressors and reciprocating pumps. The torque of the motor must at all points up to full speed, be in excess of the torque required. The greater the excess torque, the faster the acceleration.

If the time to accelerate is greater than about 20 seconds, special motors or starters may be required to avoid overheating.

Running torque is determined by the horsepower and speed of the driven machine. At any given speed and horsepower required the torque in pounds-feet can be determined by the formula:

$$t = (5250 \times hp.) \div \text{speed in r.p.m.}$$

where t = full-load torque in lb.-ft.
$hp.$ = horsepower of driven machine
$r.p.m.$ = speed at above horsepower

The peak horsepower determines the maximum torque required, and the motor must have a breakdown or maximum running torque in excess of this figure, to avoid stalling. Certain machines, such as reciprocating compressors, have load torques that pulsate periodically. To prevent excessive pulsation in the line current of the

ABLE III.

TYPES OF MOTORS AND THEIR SPEED RANGES

SINGLE-PHASE, A. C.

Types	Speed Ranges
Brush-shifting repulsion motor*	2½:1
Capacitor motor with tapped winding*	2:1
Multispeed capacitor motor	2 or 3 fixed speeds

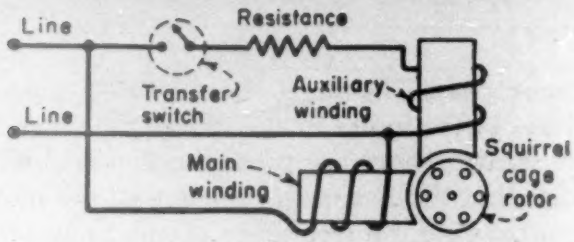
POLYPHASE, A. C.

Multispeed squirrel cage	2, 3, or 4 fixed speeds
Wound-rotor motor*	2:1
Two-speed wound-motor motor*	4:1
Brush-shifting shunt motor	4:1
Brush-shifting series motor*	3:1
Squirrel-cage motor with variable frequency supply	Very wide range
Speed variator	Very wide range

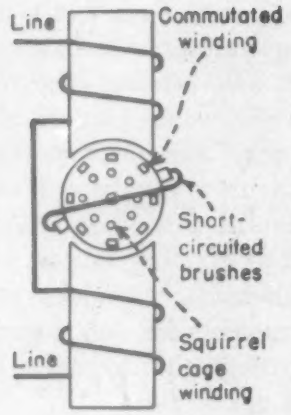
DIRECT-CURRENT

Shunt-wound standard constant-speed motor with field control	2:1 in some cases
D.c. motor with armature control*	Wide
Adjustable-speed motor	3:1 to 6:1
Shunt motor wih adjustable voltage supply	Very wide

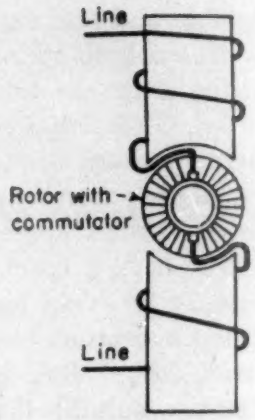
*Has relatively wide speed regulation, which makes it unsuitable for some types of applications



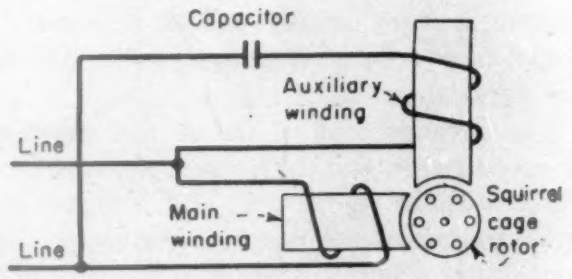
Split-phase motor



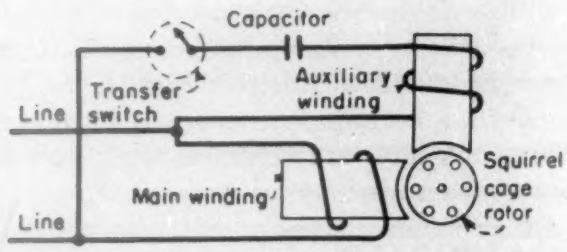
Repulsion-induction motor



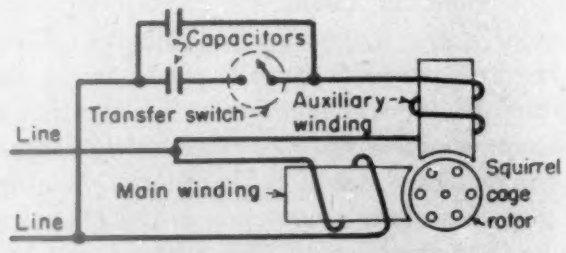
Series, varying-speed universal (a.c. or d.c.) motor



Permanent-split capacitor motor



Capacitor-start, induction-run capacitor motor (also known as the capacitor-start motor)



Capacitor-start, capacitor-run capacitor motor (also known as the two-value capacitor motor)

Schematic diagrams of various types of single-phase motors

motor, proper flywheel effect (WK^2) must be provided either in the motor or the driven machine. Where synchronous motors are used, the flywheel effect must be such that the natural frequency of the motor does not approximate the frequency of any impulses in the load torque. Where this condition is expected to occur, consult the motor manufacturer.

Mechanical Arrangement of Machine. This feature usually determines whether horizontal or vertical motors are needed. Horizontal motors are more generally available and less expensive than the vertical type. If it is desirable to operate a horizontal motor in a vertical position, a grease-lubricated, ball-bearing design must be used. Fractional-horsepower, waste-packed, sleeve-bearing motors are satisfactory for short periods of vertical operation where no thrust is involved. If sleeve-bearing motors are to be operated momentarily with a tilted shaft, a special bearing housing design will be necessary to avoid loss of lubricant. For long periods of tilted operation, bearings suitable for end thrust may be necessary. Ball-bearing motors with grease lubrication are suitable for tilted operation.

Where the driven machine requires mounting the motor with the feet above or to one side of the shaft, a rearrangement of the end shields of most motors will make them suitable. If operation at a changing angle from the horizontal (with the shaft remaining horizontal) of more than 10 or 12 degrees is necessary, ball-bearing motors usually will be required. Within this angle, sleeve-bearing motors with modified oil gages are applicable.

The arrangement of the driven machine, its speed or speed range, and the horsepower and torque requirements usually determine the method of connection between motor and machine. Always consider direct connection where the required speed coincides with the available motor speed. Maintenance, efficiency, power factor, space, and initial cost may influence the choice between direct connection and other methods.

Where large numbers of motors are involved, it is well to consider the various types of mounting arrangements which most motor manufacturers furnish as mechanical modifications. Also, if many motors are involved, a built-in construction, as where parts of the driven machine are common with, and complete, the motor structure, may be economical.

Other common types of motor-to-machine connection are flat belt and V-belt drives, chain drives, and gear drives. With belt drives, the diameters and widths of pulleys and their center distances are factors in determining motor-bearing pressures and shaft deflection.

Where the speed of the driven machine is higher or lower than is normally considered economical for motors, a gear drive may be indicated. Gear drives may take the form of a simple, speed-increasing or speed-reducing gear arrangement between motor and machine. The three units may be connected together by one of the previously mentioned methods. A widely used type of gear drive is the motor-mounted gear or geared motor to be described later. This type of unit is compact and can be obtained in a variety of mechanical constructions with speed ratios of 3 to 1 upward, and usually limited to about 75 horsepower maximum, although larger units have been built.

Inertia of Driven Machine. The inertia or flywheel effect (WK^2) of the rotating parts of the driven machine affects the accelerating time and, therefore, the heating of motors and control, particularly where reversing duty or frequent starting is involved.

With synchronous motors, the WK^2 must be known since the pull-in torque required varies approximately as the square root of the WK^2 of motor and load. The WK^2 of the rotating member of a machine which operates at a different speed from that of the motor will be converted to an equivalent value at the motor shaft if multiplied by:

$$\left(\frac{\text{r.p.m. of rotating member}}{\text{r.p.m. of motor}}\right)^2$$

Other Considerations. The driven machine may impose an axial thrust on the motor bearings. Standard ball-bearing motors often have sufficient thrust capacity. Extremely heavy thrust may require special plate-type, oil-lubricated bearings, or special high-thrust ball bearings.

Certain driven machines, such as precision grinders and boring spindles, require motors that are specially balanced to give small amplitudes of vibration.

Driven machines may require motors with limited or zero endplay, obtained by the use of pre-loaded ball bearings or sleeve bearings that are equipped with endplay-limiting devices.

Frequency of starting the machine affects the motor and control by increasing their heating, particularly where accelerating time is relatively long. In general, machines that start more than four to six times per hour may require special motors and control.

Some machines must be decelerated quickly and will require control for dynamic braking of synchronous and d.c. motors, or plugging of induction motors.

Where a machine operates a large number of hours per year, motors with higher efficiency may often be justified, even at higher prices. As a rule, however, it is seldom possible to make any over-all savings by specifying higher than normally guaranteed efficiencies.

SURROUNDING CONDITIONS

Surrounding conditions that affect operation of electric motors include ambient temperature, altitude, adverse atmospheres (excessive moisture, corrosive or solvent vapor, or dust), and water.

Normal ambient temperature is assumed to be not more than 40 deg. C. Class A insulated motors may be used so long as the total observable temperature (ambient plus rise) does not exceed 90 deg. C. for open motors and 95 deg. C. for enclosed motors. These limits may be raised to 110 deg. C. for open motors and 115 deg. C. for closed motors by using Class B insulation.

An ambient temperature lower than about 0 deg. C. (32 deg. F.) may necessitate a change of lubricant.

No change in design is considered necessary for most electrical machines for altitudes not exceeding 3300 feet above sea level. At higher altitudes, the temperature rise of electric equipment generally will increase

approximately 1 per cent for each 330 feet increase in altitude above 3300 feet.

Operation in atmospheres laden with steam or excessive moisture may necessitate use of special insulation, low-voltage design, and/or enclosed motors and control. Where corrosive or solvent atmospheres harmful to insulation are involved, totally enclosed or enclosed, ventilated equipment is preferable, although open motors with special insulation may be suitable.

Hazardous atmospheres of flammable gases and combustible dusts are classified by the National Electrical Code, and require explosion-proof or dust-explosion-proof motors in accordance with the classification. Local inspection authorities usually will determine the degree of hazard involved.

Atmospheres containing abrasive or conducting, but not combustible, dust usually necessitate use of dust-tight enclosed motors. As an alternative, pipe-ventilated equipment may be used. In some cases open motors with special insulation may suffice.

Outdoor application calls for the use of a total enclosure. A change in lubricant with seasonable variations may be necessary where temperature range is extreme. Splashproof or protected-type motors usually should be restricted to low voltages and mild climate. Special weather-resisting finishes are necessary, and periodic painting with weather-resisting paint is advisable.

Open or drip-proof motors should not be used outdoors without approval of the motor manufacturer.

Where operation for long periods under water is required, special enclosed equipment with counter air pressure to prevent the entrance of water is necessary. For occasional flooding or submersion, extremely tight, totally enclosed, non-ventilated motors, equipped with stuffing boxes, may suffice.

Where hosing down or splashing water is involved, splashproof motors may meet all but the most extreme conditions, but enclosed motors are preferable. Open (drip-proof) motors may be used if sanctioned by the manufacturer.

CODES, STANDARDS, ORDINANCES

Motors and control must conform to local and national standards, such as the following, in order to permit connection of power, satisfy safety and fire requirements, and permit lowest insurance rates.

1. NEMA Standards, which recommend certain mounting dimensions for induction motors and, in general, minimum performance characteristics of all types of motors and control.
2. AIEE Standards, which specify temperature limits for insulation materials and prescribe methods of rating and testing apparatus.
3. National Electrical Code, which is the general guide of inspectors in determining the acceptability of enclosure, protection, and installation of motors.
4. State laws, which stress safety and reduction of fire hazards.
5. City ordinances which may specify particular constructions considered necessary locally to avoid fires and accidents.

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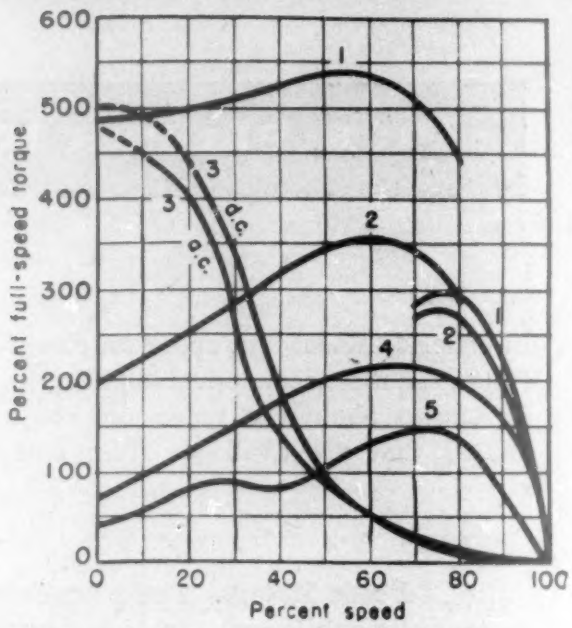
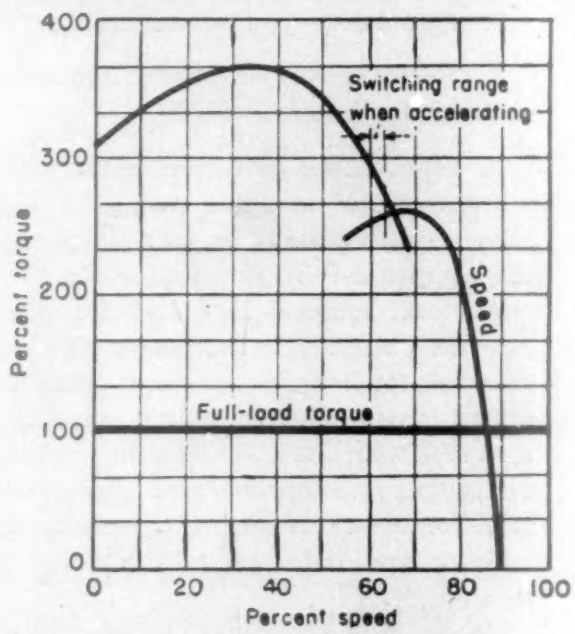
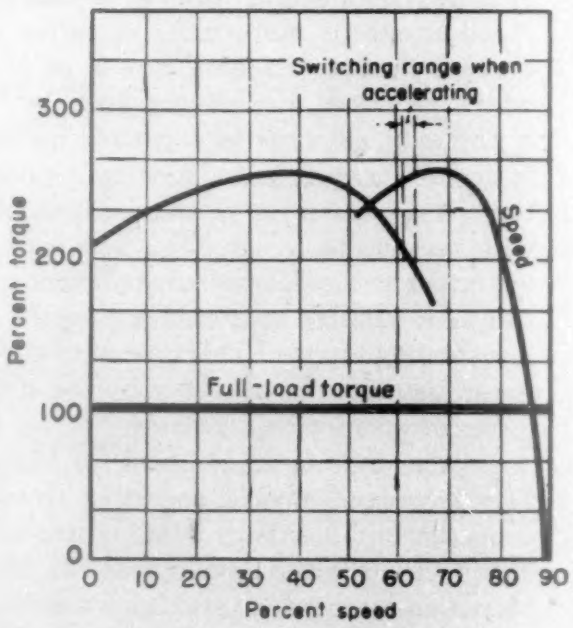


Typical speed-torque curves of fractional-horsepower single-phase motors

1. Capacitor-start motor
2. Split-phase motor
3. Series motor
4. Permanent-split-capacitor motor
5. Shaded-pole motor



Typical speed-torque curve of high-starting-torque integral-horsepower capacitor motor



Typical speed-torque curve of normal-starting-torque integral-horsepower capacitor motor

PICK PROPER MOTOR

In order to select and apply an electric motor so as to obtain the most economical installation, something must be known about the types and characteristics of the motors that are available from most manufacturers.

A. C. MOTORS

Single-Phase Motors. These motors are widely used in domestic appliances. In industry they usually find use on such equipment as power tools, fans, blowers, and heating and air conditioning units.

Single-phase motors may be roughly divided into three classifications:

1. Single-phase induction motors with a squirrel-cage winding.
2. Repulsion-type commutator motors.
3. Series or varying-speed universal motors; also a commutator-type motor.

A single-phase induction motor with a squirrel-cage winding requires some means of supplying starting torque. In addition to a single-phase stator winding, the repulsion-induction motor has two rotor windings, one a cast squirrel-cage and the other a wire-wound repulsion winding terminating on a commutator. The commutator brushes are short circuited. Currents induced in the short-circuited winding produce a field that acts with the main field to produce starting torque and give repulsion characteristics similar to those of a series motor. Near synchronism the squirrel-cage winding predominates and the motor runs as an induction motor.

Other induction-type, single-phase motors derive their starting torque from a two-phase, revolving-field characteristic. The capacitor-type motor has two stator windings physically displaced. The main winding is connected directly across the line, while the auxiliary or starting winding is connected to the line through one or more units of series capacitors. The current in each winding is out of phase electrically, which produces a revolving field.

The simplest type of capacitor motor, mechanically, is the low-torque, permanent-split-phase capacitor motor. A capacitor is permanently connected in series with the auxiliary winding. The capacitor gives quiet operation and good operating efficiency, and the starting torque is suitable for direct-connected drives requiring low starting torque. This type of motor can be arranged for adjustable-varying speed by use of a tapped winding or autotransformer regulator.

A capacitor motor designed for high starting torque may have undesirable operating characteristics if the capacitor and auxiliary winding are left on the circuit. This fact led to the development of the capacitor-start, induction-run motor (also known as the capacitor-start motor) in which a centrifugal mechanism cuts out the auxiliary winding and the capacitor after the motor has accelerated to about 80 per cent of synchronous speed.

The capacitor-start, capacitor-run type (also known as the two-value capacitor motor) employs two capacitors in parallel. One of these capacitors is designed for the best operating characteristics and the other for the best starting characteristics. A centrifugal device cuts out the starting capacitor when the motor reaches the proper speed.

The series or universal motor is designed for use on either alternating or direct current. It is provided with a field winding on the stator, which is connected in series with a commutating winding on the rotor. Full-load speeds generally range from 5000 to 10,000 r.p.m., with no-load speeds from 12,000 to 18,000 r.p.m.

Polyphase Induction Motors. The requirements for integral-horsepower polyphase motors are well covered by three types of squirrel-cage motors (two are special-purpose machines) and the wound-rotor motor. Control devices for polyphase induction motors play an important part in their proper application.

Basic types of squirrel-cage motors are:

1. Normal-starting torque, low-starting current.
2. High-starting torque, low-starting current.
3. High-starting torque, high slip.

The normal-starting torque, low-starting-current motor has been developed primarily to meet the increasing demand for squirrel-cage induction motors suitable for full-voltage starting.

The high-starting-torque, low-starting-current motor was developed principally for automatic compressor application where high-starting torque with magnetic control and full-voltage starting was desired. In most instances, this type of motor has a rotor with two squirrel-cage windings. The arrangement of the two squirrel-cage windings forces the starting current to flow through the high-resistance winding, providing high starting torque with low starting current. Under running conditions, the current flows through the low-resistance squirrel-cage winding, thus providing the most efficient operating characteristics.

The high-starting-torque, high-slip motor is utilized in applications such as winches and capstans where high starting torque is needed but full-speed running time is short. It is also used, because of its high slip, on punch press and similar applications where flywheels are involved.

All open, continuously rated, 25-, 30-, 40-, and 60-cycle polyphase induction motors, when operated at rated voltage and frequency, will carry full load continuously without exceeding 40 deg. C. rise.

This temperature rise applies to Class A insulation and is based on an ambient, or surrounding, temperature not exceeding 40 deg. C. and an altitude not greater than 3300 feet above sea level.

Open, continuously rated, 40 deg. C. rise, 60-cycle induction motors will operate continuously on 50 cycles at rated load and voltage without exceeding 50 deg. C. rise.

torque integral-horsepower capacitor motor

Splashproof and special drip-proof motors, when operated at rated voltage and frequency, will carry full load continuously without exceeding 50 deg. C. rise under standard conditions of temperature and altitude.

Some manufacturers furnish a combination open and drip-proof motor. These motors will be rated 40 deg. C. rise under standard conditions.

All totally enclosed, non-ventilated, and totally enclosed fan-cooled, continuously rated motors will carry full load continuously without exceeding 55 deg. C. rise under standard conditions.

All open and open drip-proof, continuously rated 40 deg. C. rise polyphase induction motors (except the high-slip type), when operated at rated voltage and frequency, will carry continuously 1.15 times the rated load with possible slight differences in efficiency and power factor from those at rated load.

This service factor does not apply to totally enclosed, totally enclosed fan-cooled, and splashproof motors.

The rated full-load speed is an approximate value which always equals or exceeds the published value except in the case of wound-rotor motors, whose speed is affected by the resistance of the secondary cables and control, and high-slip motors, for which average speed is shown.

D. C. MOTORS

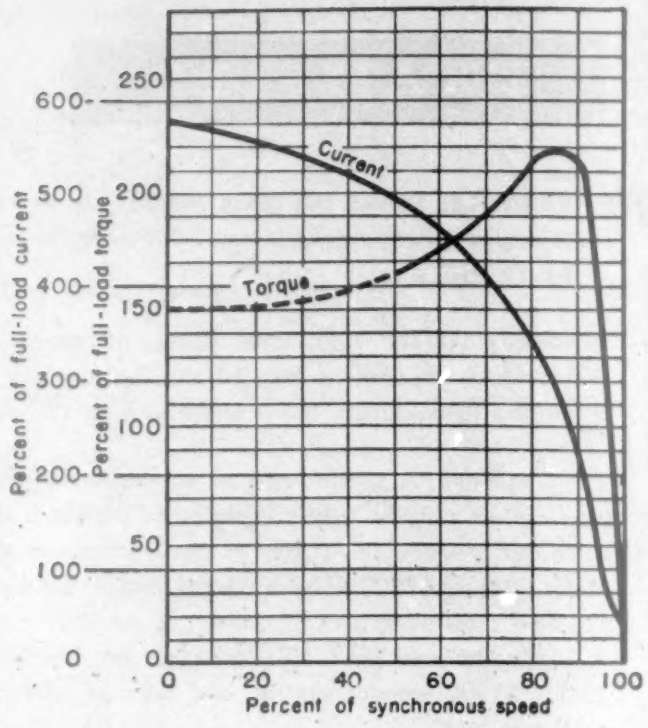
The high standards of performance required by many industrial applications can be obtained more readily with d.c. motor drives and in some instances can be obtained only with them. The chief advantages of d.c. motors are: (1) Adjustable speed; (2) speeds not limited to synchronous zones; (3) greater flexibility of speed-torque characteristics; (4) ease and simplicity of control.

Direct-current motors may be divided into four general types: (1) Shunt-wound, both constant- and adjustable-speed; (2) compound-wound; (3) series-wound; (4) special-purpose motors, which are variations of the first three.

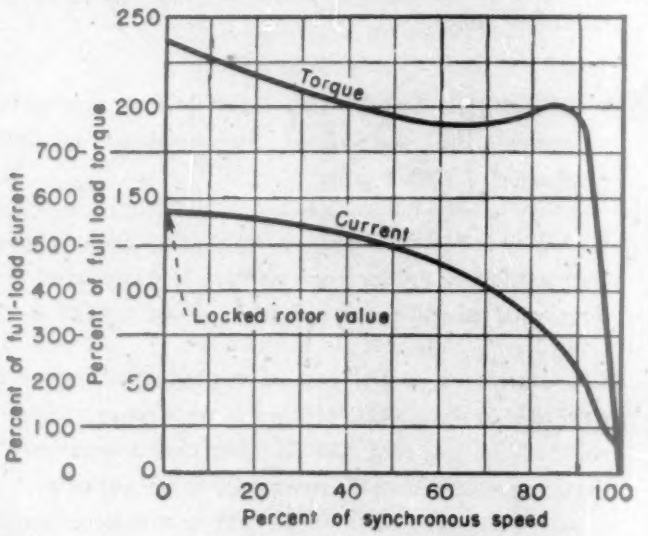
Shunt-Wound Motors. On a steady voltage and with fixed field excitation, shunt-wound motors operate at approximately constant speed regardless of load. From no load to full load, there is some drop in speed. It ranges from 10 to 15 per cent of full-load speed, varying with saturation, armature reaction, and brush position. Constant-speed shunt d.c. motors are designed for operation over speed ranges of less than 3 to 1. They deliver constant horsepower from basic speed to maximum speed.

With full field excitation, it is possible to supply an adjustable voltage to the armature to obtain speeds below basic speed, with constant torque. The minimum speed at which the motor can operate is limited by temperature rise because the motor carries full-load current at the lower speed and natural ventilation, of course, is reduced.

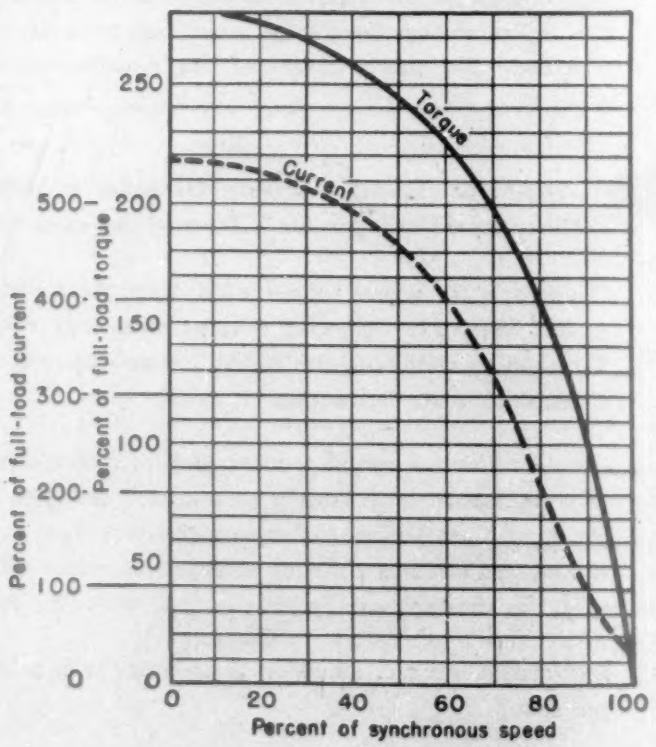
Adjustable-speed shunt motors are designed to operate over a speed range of 3 to 1 or greater by field control. They are shunt-wound and either constant



Typical speed-torque and speed-current curves for normal-starting-torque squirrel-cage motor



Typical speed-torque and speed-current curves for high-starting-torque squirrel-cage motor



Typical speed-torque and speed-current curves for high-starting-torque, high-slip squirrel-cage motor

EXAMPLES

EXAMPLE. ***Select the best motor for driving a centrifugal pump, requiring 75 horsepower at 1725 to 1775 r.p.m.***

Conditions. At 440 volts, three phase, 60 cycles is available. Surrounding atmosphere may be slightly corrosive particularly damaging to insulation. Pump operates 8 to 12 hours per day.

Considerations. A synchronous or an induction motor may be used. Either must be totally enclosed to protect it from the corrosive atmosphere. Initial cost of the synchronous motor will be approximately $2000 without control, and its full load efficiency will be 92 per cent.

A totally enclosed fan-cooled induction motor will cost approximately $1000 without control, and have a full-load efficiency of 91 per cent.

Best Choice. In this instance it would be difficult to offset the difference in initial cost by energy savings due to better power factor and higher efficiency. The logical choice would be the induction motor.

●

EXAMPLE. ***Select the best motor for driving a d.c. generator. Required horsepower is 500 and the speed 1200 r.p.m.***

Conditions: Power supply is 440 volts, three phase, 60 cycles. Surrounding conditions are normal. It is expected that the motor-generator set will operate lightly loaded part of the time.

Considerations. Initial cost of an induction motor drive will be approximately $3000. Efficiency and power factor at full load will be 93.5 per cent and 90.5 per cent respectively. At half load these values become 92 per cent and 83 per cent.

A synchronous motor drive will cost approximately $2800. Its efficiency and power factor at full load will be 94.8 per cent and 100 per cent respectively. At half load these values become 92.7 per cent and 88 per cent leading.

Best Choice. In this instance the synchronous motor seems to be the logical choice. Even if the initial cost were higher the better efficiency and power factor of the synchronous motor would favor it.

●

EXAMPLE. ***Select a motor drive for a belt conveyor. Required horsepower is 10 and the speed is 20 r.p.m.***

Conditions. The power supply is 220 volts, three phase, 60 cycles or 250 volts d.c. Conveyor runs at essentially constant speed. Surrounding conditions are normal. A belt drive is not practical because of space limitations.

Considerations. A speed reducer or gear motor is indicated. Because of space limitations a gear motor seems to be the most practical. Cost difference between the two types of gear drives will be small. Either a d.c. or an induction motor will be satisfactory. The constant speed makes the a.c. motor the less expensive.

Best choice. An a.c. induction gear motor with a 20 r.p.m. output speed.

horsepower or tapered horsepower, but can be furnished as constant-torque motors.

The tapered-horsepower motor delivers the lower listed horsepower, 50 deg. C. rise, from basic speed to 150 per cent basic speed, the horsepower tapering from the lower to the higher listed value between 150 per cent and 300 per cent of basic speed.

Adjustable-speed motors can be operated below basic speed by adjustable-voltage armature control. Because of commutation limitations, shunt-wound motors in integral-horsepower sizes are not suitable for across-the-line starting.

Compound-Wound Motors. The addition of a cumulative series field winding to the shunt field produces the compound-wound motor. This motor has a greater speed drop than a shunt-wound motor (about 25 per cent) from no load to full load.

Compound-wound motors are used on loads that require high starting torque or are subject to torque pulsation. They are not suitable for applications requiring adjustable speed by field control. With weakened shunt field, the series-field flux becomes a greater portion of the total flux; hence changes in load may produce unstable speed.

Series-Wound Motors. Series-wound motors have the field winding in series with the armature and are subject to wide changes in speed with changes in load. With reduction in load the speed will vary from rated value at full load to infinite speed at no load. Because of the speed characteristics, these motors are not suitable for belt drive or for any load where the torque might drop below 15 per cent of full-load torque.

SYNCHRONOUS MOTORS

As mentioned previously, synchronous motors have many advantages not obtainable with squirrel-cage induction or d.c. motors.

1. The initial cost is lower than for squirrel-cage motors in low-speed ratings (450 r.p.m. and below); for medium and large horsepower sizes (50 horsepower and above); also in very large horsepower ratings (500 to 1000 horsepower and above) at medium speeds (514 to 900 r.p.m.).

2. When applicable, synchronous motors provide power factor improvement at lower cost than by any other means.

3. Efficiencies are generally higher than for induction motors of corresponding rating.

4. Other features are constant speed independent of load, large air gap (two or three times that of induction motors), and lower starting current in some ratings.

Gear motors consist of a normal-speed motor with a built-in reduction gear, usually of the helical-planetary type. The result is an integral, self-contained unit that is highly efficient and compact.

Gear motors usually can be obtained in sizes from ⅛ to 75 horsepower and in single-phase, polyphase, or direct-current types. Output-shaft speeds usually range from 6 to 600 r.p.m. with 1800 r.p.m. motors.

TREAT MOTOR RIGHT

Whether motors are mounted on machines or applied as separate drives in the factory, a motor that is convenient to handle and easy to install saves time and money. The motor manufacturer has the obligation to furnish complete instructions for installing, wiring, and maintaining his motors. Also the obligation to design into them such features as conduit boxes with as much room as possible; graphic connection plates; easily accessible and adequate lubrication fixtures; and strong, accurately machined mounting features.

The motor user must do certain things to get the maximum benefit from the drive. The drive must be arranged to conserve floor space, and make motor and control accessible for maintenance. A strong, rigid support must be provided for the motor and, in most cases, for the driven machine. Motor and control must be well ventilated and adequately protected from adverse atmospheric conditions such as abrasive dust, dripping water, or acid fumes, unless special construction designed to meet the conditions is used.

Above all, the motor user must guard against excessive ambient temperatures, or excessive temperature rise of the motor. It should be operated strictly in accordance with the manufacturer's instructions and the nameplate rating of the motor.

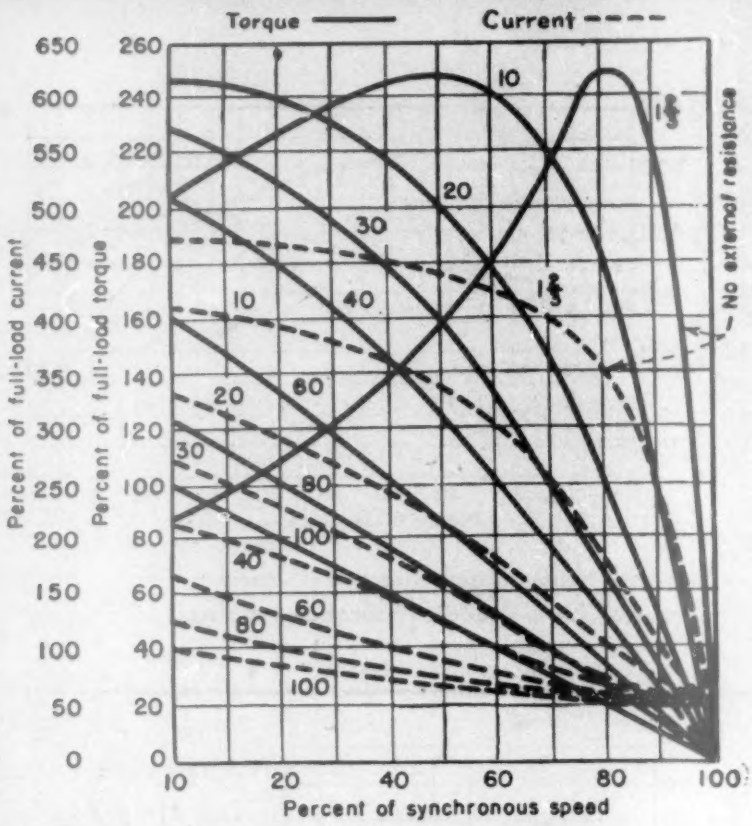
A little extra care while installing is a good investment. For example, trouble may be avoided by examining the brushes of a d.c. or single-phase repulsion motor to make sure that they are seating properly and with the proper pressure. It is always good practice to turn a motor over by hand before applying power for the first time, to make sure that it turns freely and that nothing has fallen into it during shipment or handling.

Check the nameplate to make sure that the motor has the correct horsepower and speed for the job. Nameplate data should agree with the power supply available. The standard nameplate voltage usually will be slightly lower than the nominal system voltage; for example, 440 volts for a nominal 480-volt system. If the motor is rated for two voltages, see that it is connected for the proper voltage.

With small motors it is sometimes well to make the electrical connections to the motor before bolting it into place. If any loose part falls into the motor, it may be easily removed. All connections must be made so that vibration will not be able to loosen them.

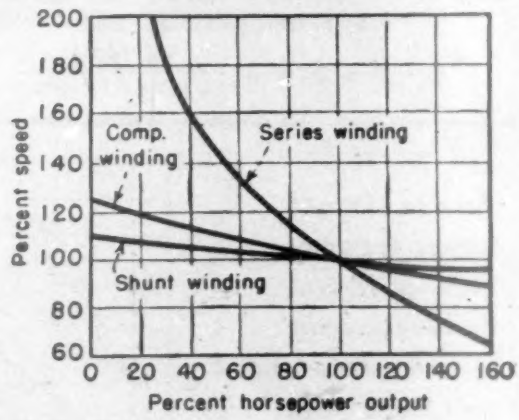
Motor and control wiring should be installed in accordance with the National Electrical Code and any local requirements. It should have sufficient capacity to carry the full-load current with a maximum voltage drop of 2 per cent of line voltage. Ground motor frames in accordance with the Code.

It is best to leave the motor disconnected from the load for the initial start, particularly if the direction of rotation is important. Operate the motor without load for about an hour to test for unusual localized heating

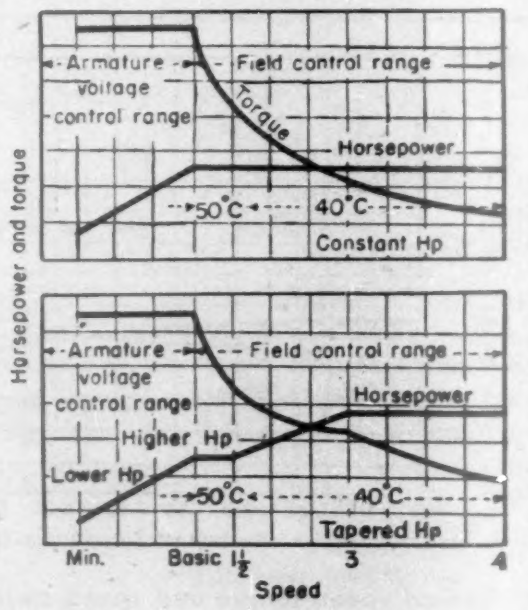


Typical speed-torque and speed-current curves for wound-rotor induction motor

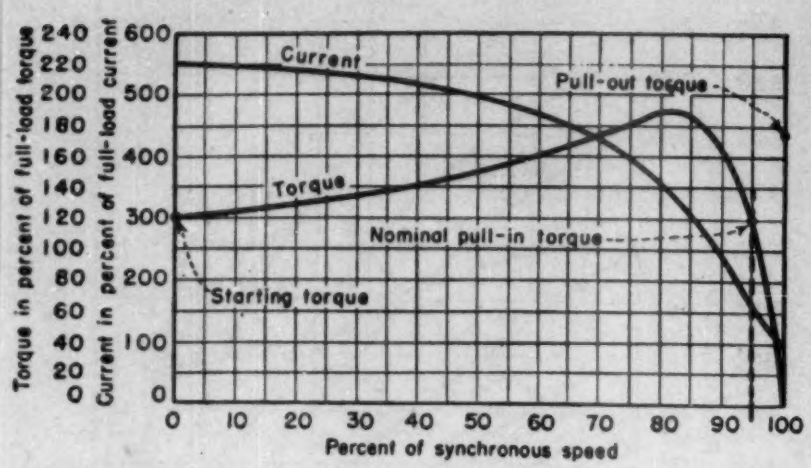
(The numbers on the curves indicate the secondary [rotor] circuit resistance in per cent of the value required to give full-torque at standstill)



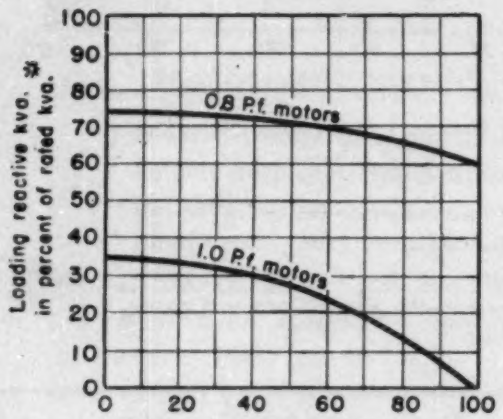
Typical speed-output curves, adjustable-speed d.c. motors



Typical characteristic curves of constant-speed d.c. motors



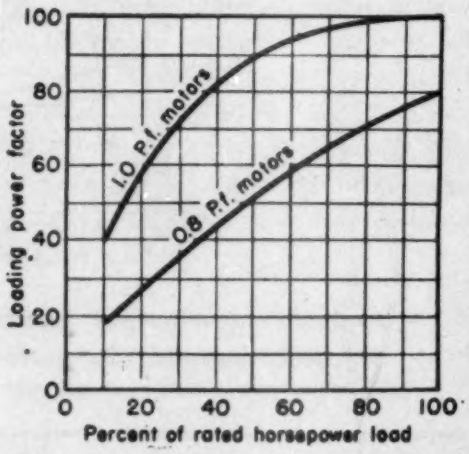
Typical speed-torque and speed-current curves of high-speed synchronous motor

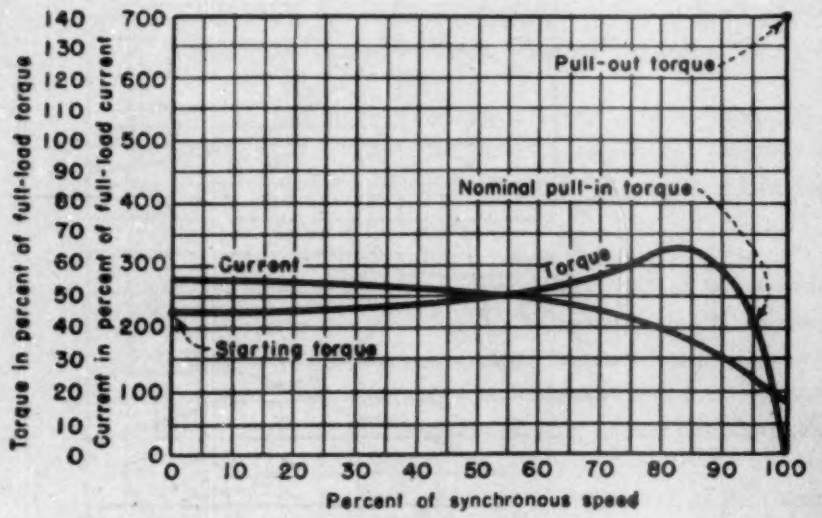


* Rated kva. = 0.746 x Hp. rating / F.l. Eff x P.f. rating

Approximate leading kva. drawn by high-speed synchronous motors operating at partial loads with full-load excitation maintained

Approximate power factor of high-speed synchronous motors operating at partial loads with full-load excitation maintained





Typical speed-torque and speed-current curves of low-speed synchronous motor for compressor drive

of the bearings or windings. If direction of rotation is wrong, the instruction sheet accompanying the motor usually gives full instructions on how to correct.

Inspect carefully protective devices necessary for the proper and safe operation of the motor, to insure that they are in proper working order. It is important to maintain the ambient temperature below 40 deg. C., and the motor temperature rise at or below its nameplate value. In general, Class A insulation has its life cut in half for each 10 deg. C. above 90 deg. C. temperature. Therefore a motor with an expected life of 20 years would operate only 10 years if it were forced to carry continuously an overload sufficient to push its temperature rise 10 deg. C. or more above the nameplate rating.

MAINTENANCE

Electric motors are such reliable servants that it is easy to forget them and trust they will continue to run without attention. Such a policy accelerates depreciation of investment and builds up possibilities of costly production interruptions and high replacement costs. A system for regularly inspecting each motor and keeping a record of its operation and the service given it will pay dividends in lower operating cost, longer useful motor life, and few, if any, repair parts costs.

The purpose of maintenance work is to insure continuous and satisfactory operation of the equipment. During inspections, therefore, particular attention should be paid to minor defects that may be indications of future trouble. As a part of the maintenance inspection, the sounds made by a motor starting, running, and stopping are important. Rough commutators, faulty operation of the centrifugal mechanism on single-phase motors, and many other faults can be detected.

Feeling a motor and its bearings may lead to a check on overheating, which should always be verified with a thermometer.

TABLE IV

SALIENT POINTS IN MOTOR MAINTENANCE

1. Check lubrication and oil or grease bearings. (With ball-bearing motors, caution must be exercised to see that the motor is greased properly, according to manufacturer's instructions. Overgreusing results in more ball bearing failures in motors than all other causes combined.)

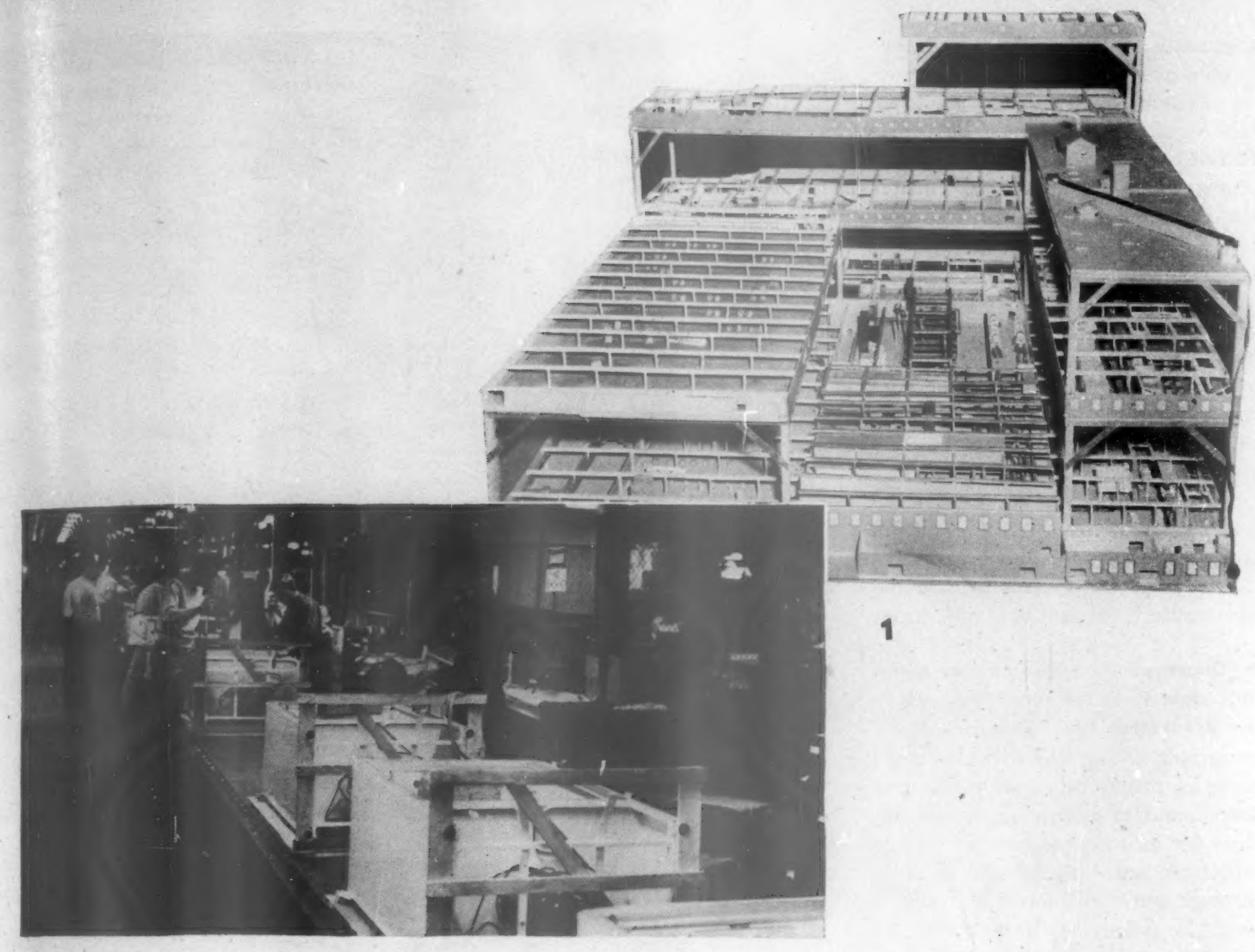
2. Inspect brushes, brush contact surfaces, and brush springs Note any commutator sparking that occurs during operation.

3. Inspect commutator for wear or roughness that may have been caused by commutator sparking.

4. Question the machine operator on his experience with the motor since the last inspection.

5. Look, listen, smell, and feel for indications of possible trouble with the motor when starting, stopping, running, and at standstill.

6. Wipe off motor and check for loose mounting bolts.



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"HANDS OFF" HANDLING FOR HIGH PRODUCTIVITY

G. P. KENNEDY • ASSISTANT PLANT MANAGER, NORGE DIVISION, BORG-WARNER CORPORATION, MUSKEGON, MICH.

"Hands off" is the materials handling policy at the Norge Division. Mechanical refrigeration units are completely assembled, charged, inspected, and tested on six independent overhead conveyor systems. Delivery of these refrigeration units to a second building is carefully synchronized with the assembly of refrigerator cabinets on a series of integrated elevator, overhead, belt, and roller conveyors.

The result: *continuous material flow without manual handling from the receiving platform to the shipping dock.* Quality has been increased, labor costs have been maintained against increased rates, handling costs lowered, and physical effort has been minimized.

1. Planning began with a three-dimensional scale model of the plant. (One section only shown in photograph.)

Key points decided upon *before* installation of the new system:

Eliminate the **necessity** for removing material from conveyors at any time. Exceptions—for storage of raw materials or unprocessed parts; for joining of parts or assemblies when it is *impossible* to do so without removal.

Eliminate crossing of flow lines. When this cannot be done, they *must* cross at different levels, so

that material flow will not be interrupted at any point.

Provide automatic switches wherever materials must be transferred from one conveyor system to another. In other words, transfer the carrier and load from one system to the other, instead of shifting materials.

Provide "take off" switches at any point where rejections may occur (inspection points). Maintain a "float" of replacements at each of these "hospitals" so that production lines may be kept full by simply switching in another carrier.

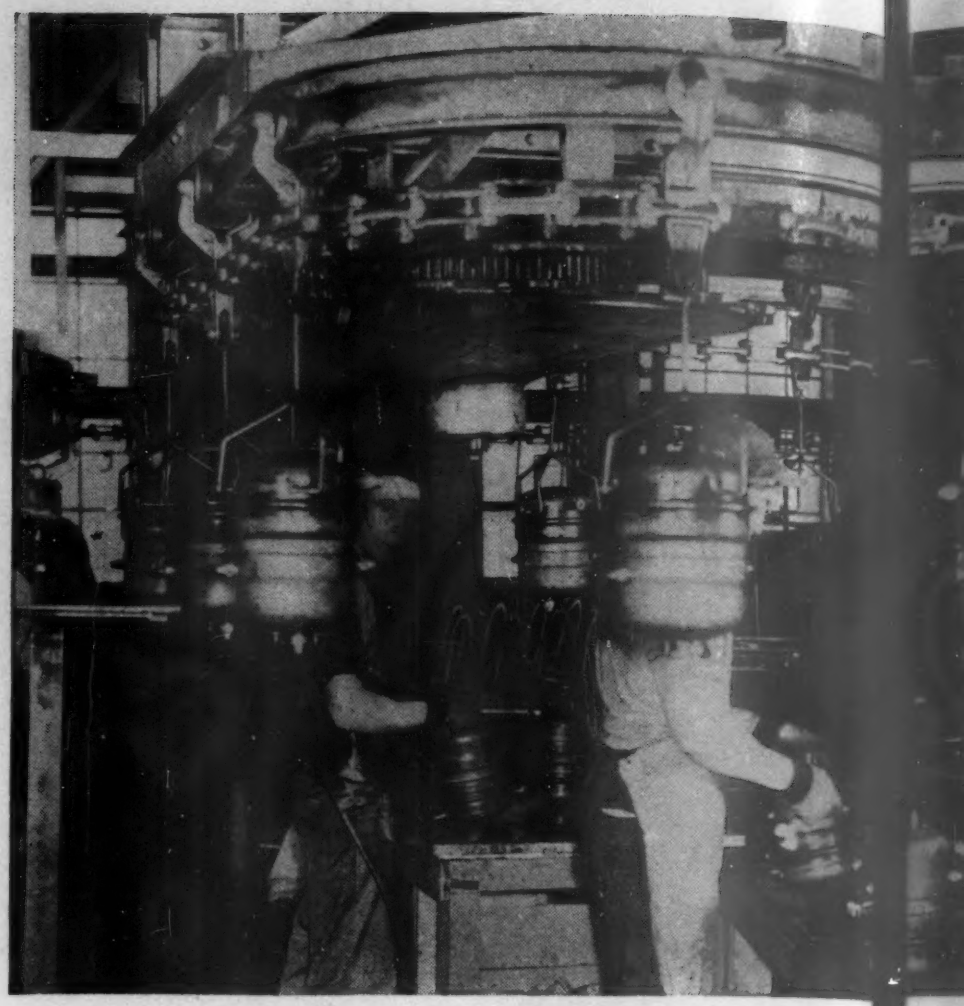
Maintain "floats" or production buffers *ahead* of the inter-system transfer points to prevent a disruption in any *one* system from being transmitted throughout the plant.

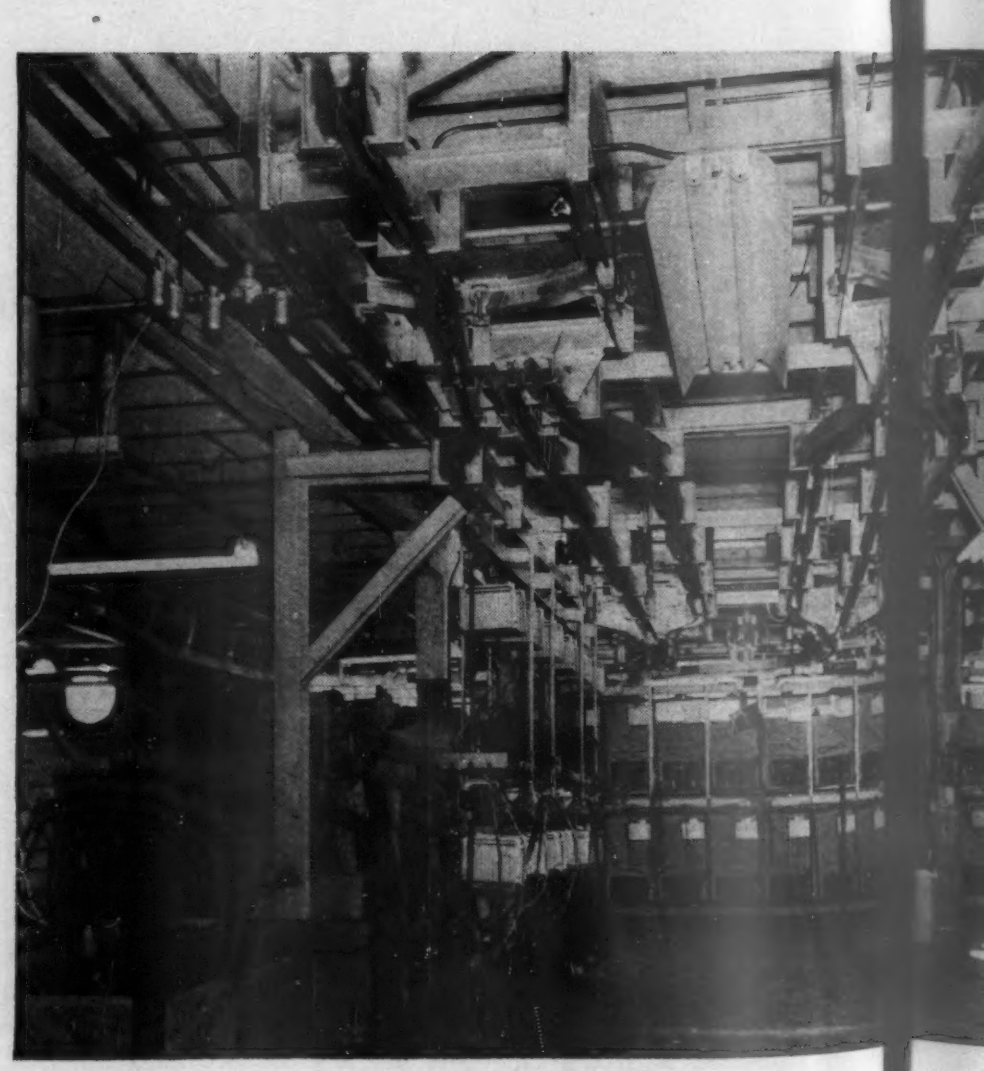
2. Overhead conveyor carries materials right from the receiving dock to the production line. Results: Parts no longer damaged in transit, lines serve as production buffers, time is saved, and receiving dock is kept clear for incoming shipments. After soldering, conveyor carries unit through water-filled trough for leak test. If defect is found, unit is immediately replaced.

3. Gaging gate and circuit breaker prevents any unit that is improperly arranged on carrier from entering washing machine. Has eliminated danger of accidents and possibility of machine becoming fouled. Conveyors are so arranged that, as they emerge from the washing machine, carriers are automatically double-tiered before entering the dehydrating ovens.

4. Banks of carriers are built up on "sidings" outside of the ovens. When one track is full, switches automatically change to carry additional units onto another section. By pushing a button, operator can release carriers singly; they are then picked up by a power chain and pulled to the ovens.

5. Overhead chain conveyor carries component parts of cabinet assembly through penthouse, thereby creates a production buffer. Delivery rate of these exterior shells, machine doors, and storage bins from the paint shop is synchronized with the delivery of





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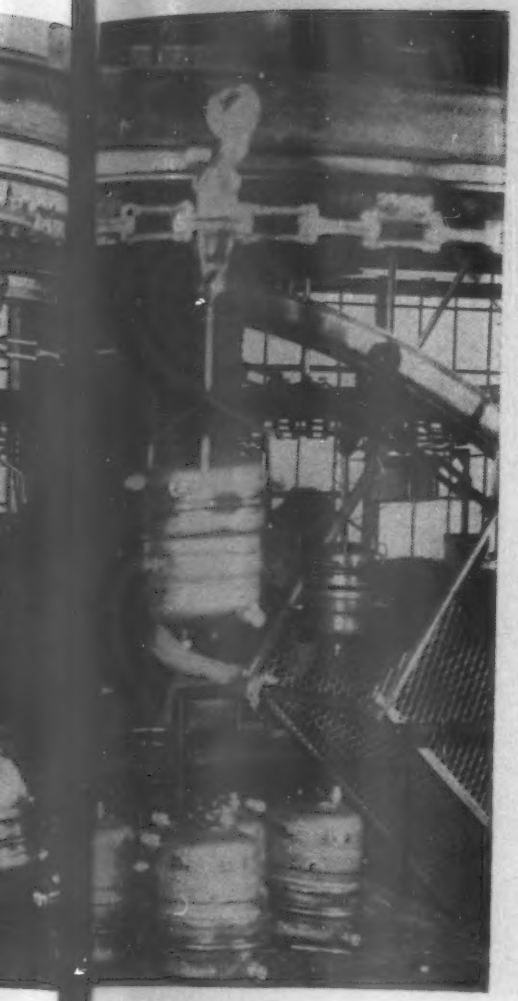

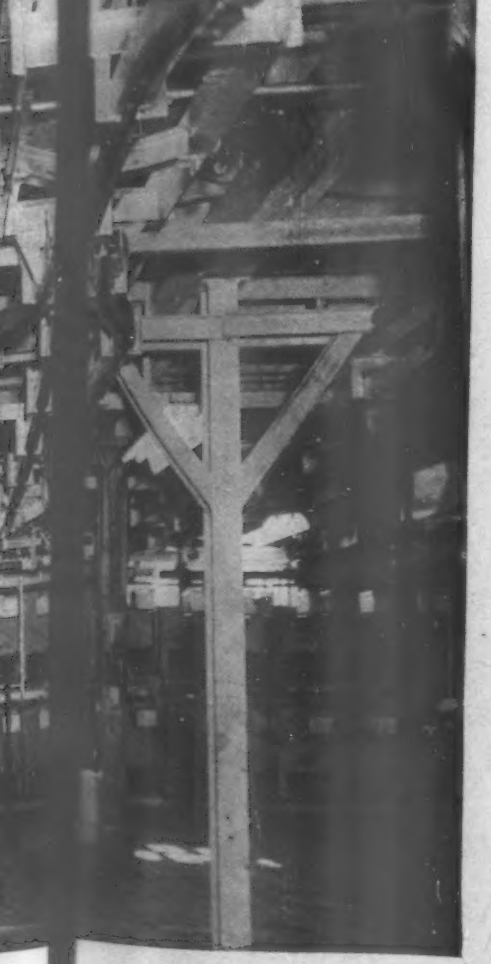

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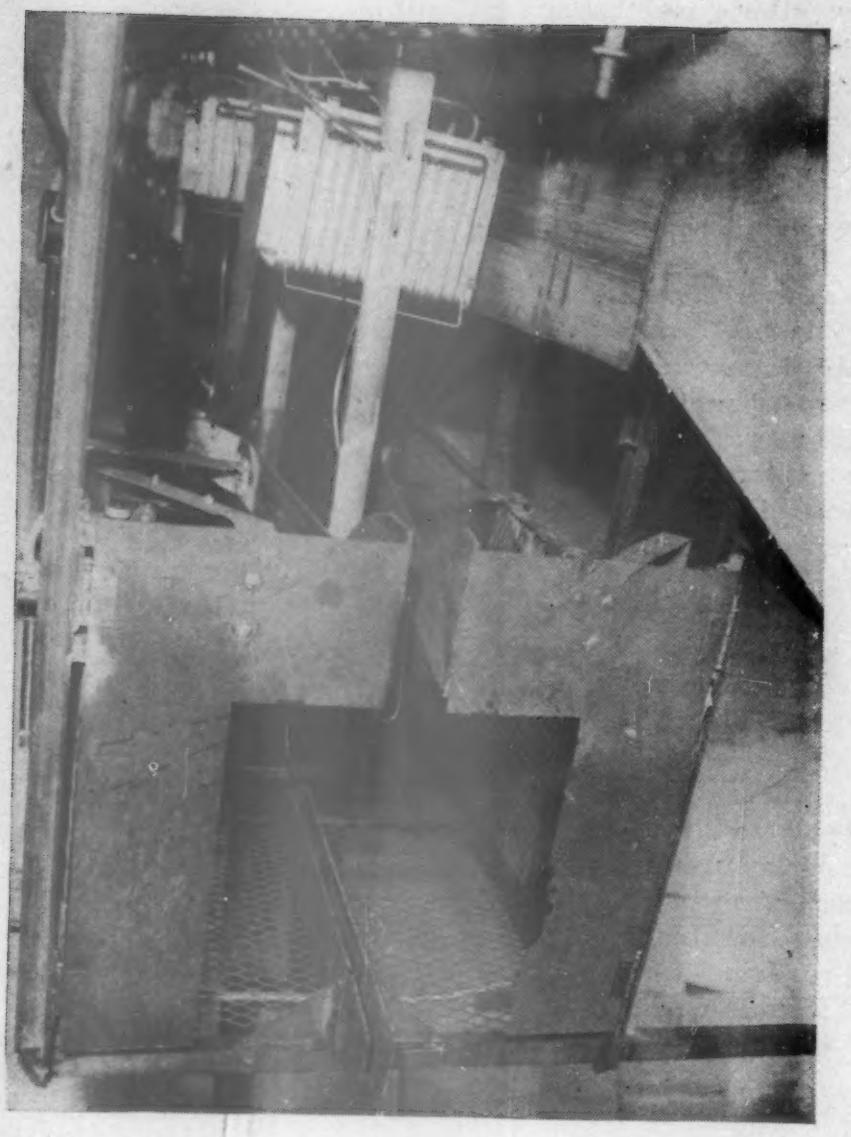

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completed refrigeration units from adjacent building.

6. Crating begins right where assembly begins. Crate stools and backs (shown here in the process of being attached) serve as skids along the entire conveyor assembly line. At stations where insulation is inserted, exhausted stacks carry dirt and fuzz away from the workmen.

7. Completely automatic tip-up raises refrigerator to vertical position; no shifting of skids is necessary. Has saved many man-hours and reduced damage; work flow is more even. When in vertical position, another power-driven belt conveyor picks up cabinet, moves it through final trim.

8. Completed units move off the final assembly belt conveyor into the lowerator. An up-coming platform engages the crate, carries it up, over, and down to an interbuilding tunnel. Here the crate slips off the platform and feeds by gravity to a belt-driven conveyor which carries it to a warehouse over a block away, completing receiving-to-shipping cycle without manual handling.

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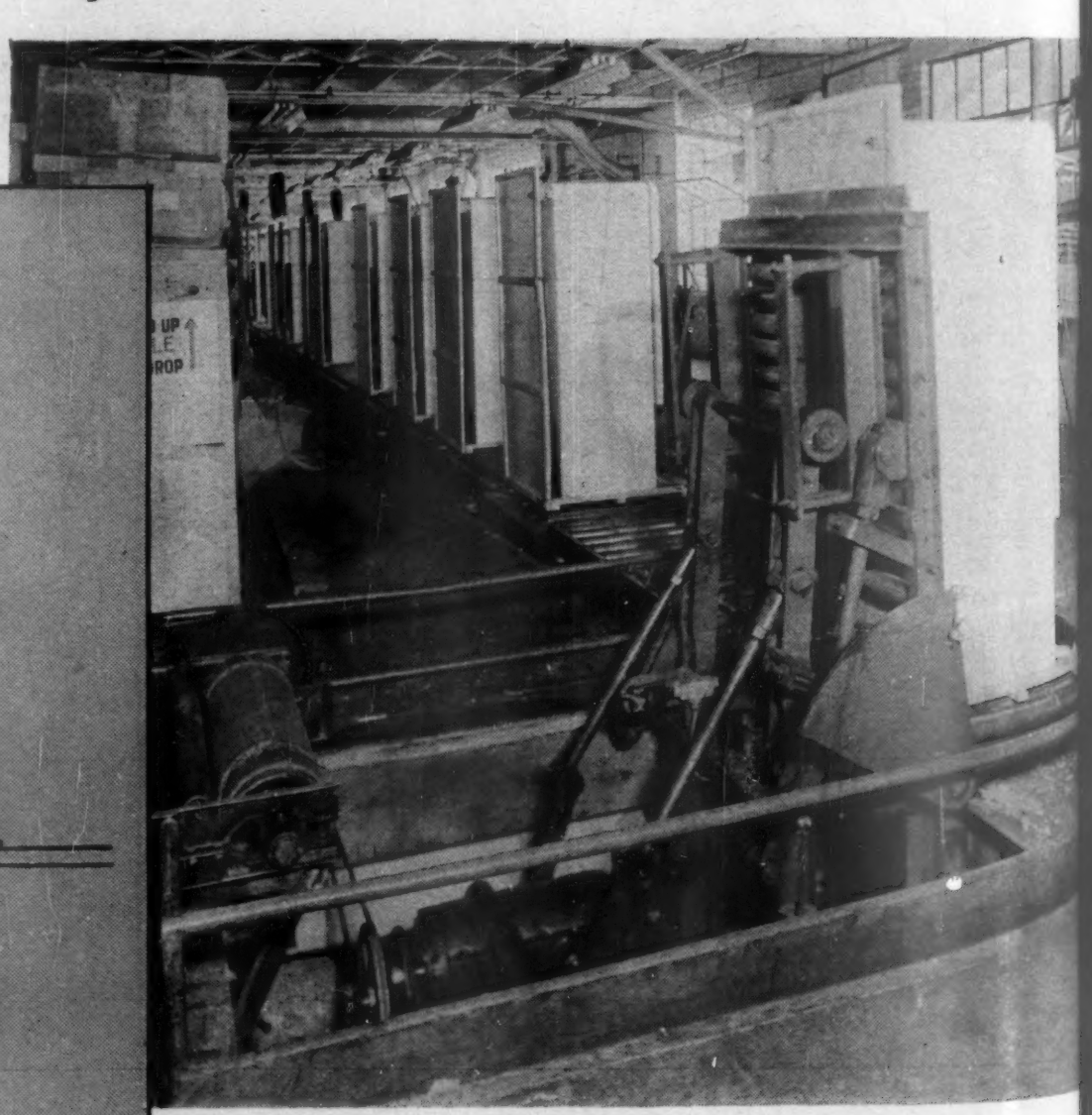

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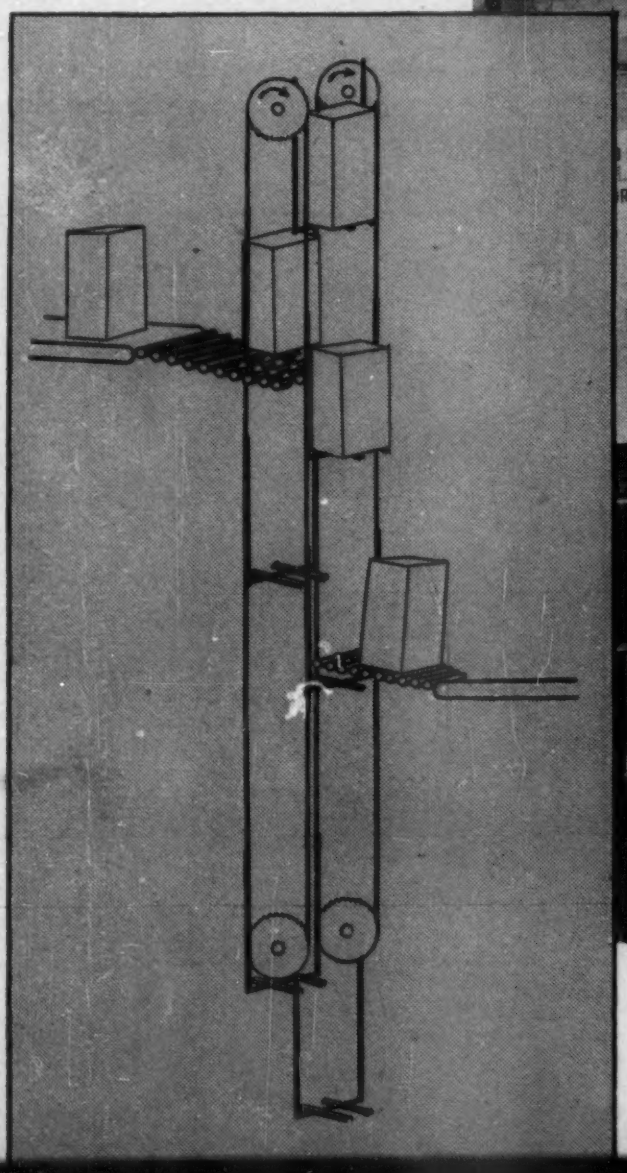


KEEPING MAINTENANCE COSTS IN LINE WITH FORECASTS

JOHN G. CHRISTFIELD • MECHANICAL SUPERINTENDENT, HERCULES POWDER COMPANY, PARLIN, N. J.

By setting up annual goals of maintenance requirements at its Parlin, N. J., plant, the maintenance department of Hercules Powder Company knows with reasonable accuracy what to expect in maintenance costs. Then, by charting and publicizing the progress of cost performance each month, it knows how well it is meeting the forecast, and when it should seek to explain wide cost variations.

This double-barreled approach to control of costs provides an excellent tool for:

1. Management — to see how maintenance money is spent, and as a summary of performance.

2. Maintenance executives—as a continuing goal for maintenance "production."

3. Maintenance workers — as a reminder of the company's interest in maintenance costs, and to give a pictorial realization of what they are doing costwise.

The results seem to justify the effort. By no means are these goal and chart procedures intended, however, to act as a maintenance budget control plan. For this is not a plant where stinting or postponement of maintenance of buildings or equipment ever pays. The plant comprises several hundred buildings, 1- to 7-story, ranging from 200 to 20,000 square feet in area, and spread over a fenced-in plot of about 175 acres.

Buildings are predominantly of permanent steel-and-masonry or corrugated asbestos construction, with a few fabricated of wood and corrugated iron dating back to 1915. Each building requires one or more services of power, light, steam, gas, air, involving use of motors, pumps, tanks, piping, agitators, heat exchange equipment, and numerous other facilities.

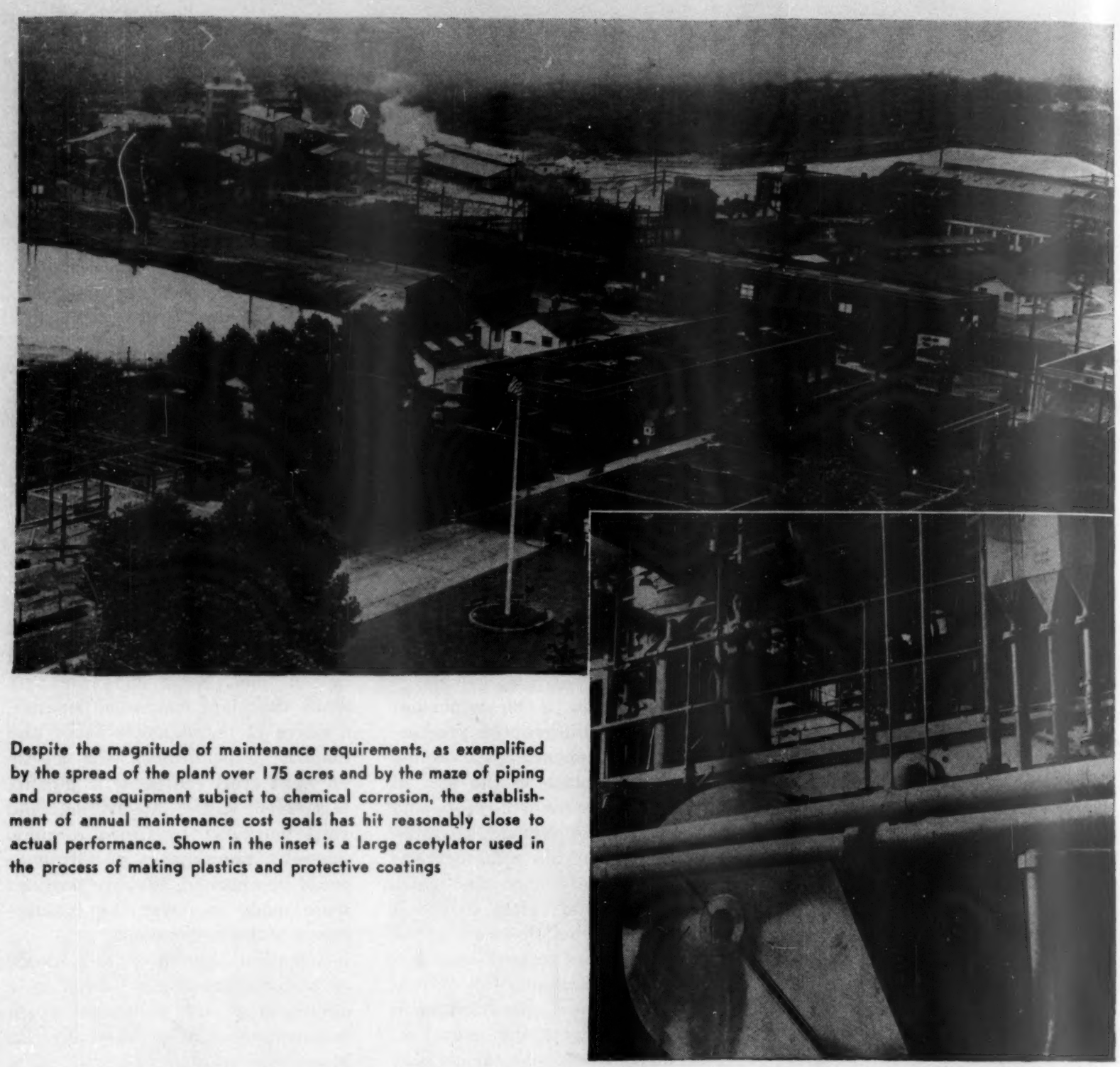
The manufacture of the company's products (nitrocellulose, cellulose acetate, nitric acid, and chlorinated products) presents the usual severe problems of corrosion attendant to the heavy chemical industry. Life of equipment ranges from 15 months to 15 years, with much of it at the shorter end.

In consequence, proper maintenance at Parlin is an important function of uninterrupted production, and maintenance costs assume an important place in the cost of product. Despite the wide scope and variety of maintenance requirements, however, the establishment of annual maintenance cost goals has hit reasonably close to actual performance. Then, by means of the monthly progress reports, management and maintenance executives are given twelve opportunities a year to investigate the causes of performance variations, and, if possible, to eliminate unwarranted activities or costly practices in order to bring the results closer to or even under the line.

The successes attained through the annual forecasts of maintenance expenditures are not the result of any sudden development. A long background of experience was required to set up estimates that could be reliably upheld by performance, or, if not, to give a good reason why. Some 20 years ago, when the plant was much smaller, a curve of maintenance labor and material expenditures was set up for each craft (carpenters, pipefitters, electricians, mechanics, and yard workers) to afford a guide whereby maintenance performance could be checked. Weekly postings were made to cover the maintenance of the entire plant.

Sometime thereafter, this record of performance was followed by a development of over-all plant maintenance goals. Logically, to know what to plan, one first had to know where he stood. Based on past

Annual maintenance requirements are developed by a conference of the maintenance engineer with an operating executive of each manufacturing area of the plant



Despite the magnitude of maintenance requirements, as exemplified by the spread of the plant over 175 acres and by the maze of piping and process equipment subject to chemical corrosion, the establishment of annual maintenance cost goals has hit reasonably close to actual performance. Shown in the inset is a large acetylator used in the process of making plastics and protective coatings

performances, therefore, the methods of forecasting maintenance costs gradually were developed and refined.

As it stands today, the determination of maintenance goals is accomplished for eight plant areas which subdivide the entire plant according to major manufacturing operations. This treatment is necessary because at Parlin the operating executive of each area, representing a major product or process, is responsible for all costs in his area, and is charged for maintenance services as a part of the cost of operation.

Aside from this requirement, the simplification of effort involved in goal determination would have dictated this method anyhow. This is because the company's cost accounting procedures, in coordination with manufacturing processes, are based primarily on plant areas, and accounts are further subdivided by operations in each area (including maintenance figures separately for crafts). Hence the accounting department is able to contribute all required statistics for goal determination and the measurement of performance.

The basis of maintenance cost comparison for goal determination at Parlin is known as "unit cost," which is a figure arrived at by dividing the gross maintenance cost of any single area (in dollars, for labor plus material) by the number of units of production in that area. For example, this unit cost might be tagged for a manufacturing area as "dollars per pound of acid."

The exhibit on the facing page shows the method of calculation of annual maintenance goals for the plant. Here goals are itemized by accounting code number (column 1) for each of the plant's eight areas. Total production (column 2), unit maintenance costs (columns 3-5), and total maintenance expenditures for the past year (column 6) are obtained from the accounting department early each January.

Estimated expenditures (column

7) are worked up at the same time by the maintenance engineer in conference with each of the area operating executives. All maintenance requirements are reviewed and agreed upon. They may involve decisions for a new roof, tank replacement, a major repair on a machine, or painting of building and equipment. Naturally, one of the objectives is to keep requirements as low as possible, consistent with effect on cost of manufacture and quality of product. The survey covers all items of repair or replacement, but never includes new equipment involving a capital expenditure.

The availability of cost figures of the previous year contributes to accuracy in estimating. The estimates cover both labor and material, which data are supplied by the maintenance engineer from a background of experience and accumulated records. Failure to include an item does not preclude action, of course, on that item if an emergency or an unpredicted need for it later arises. It does probably mean

★ The well-maintained plant is the high-production plant

that the goal will be exceeded, but then at least it is known why.

Estimated production for the coming year (column 8) is supplied by the area operating executive from market analysis figures and sales forecasts developed by management. The new maintenance goal (column 9), represented by a unit cost, is derived by dividing column 8 into column 7.

This goal is in reality an estimated average unit cost for the coming year against which actual performance may be plotted. It is of primary value to the operating executive as a yardstick to measure the maintenance costs he sustains in relation to the cost of manufacture. For example, at the close of each month, each operating executive develops and submits to management a report of operations which includes maintenance costs secured in a routine manner from the accounting department. He learns, therefore, by comparison of the monthly unit cost of performance with the goal, exactly where he stands, and is in a position to exercise restraint or satisfactorily explain departures from the goal.

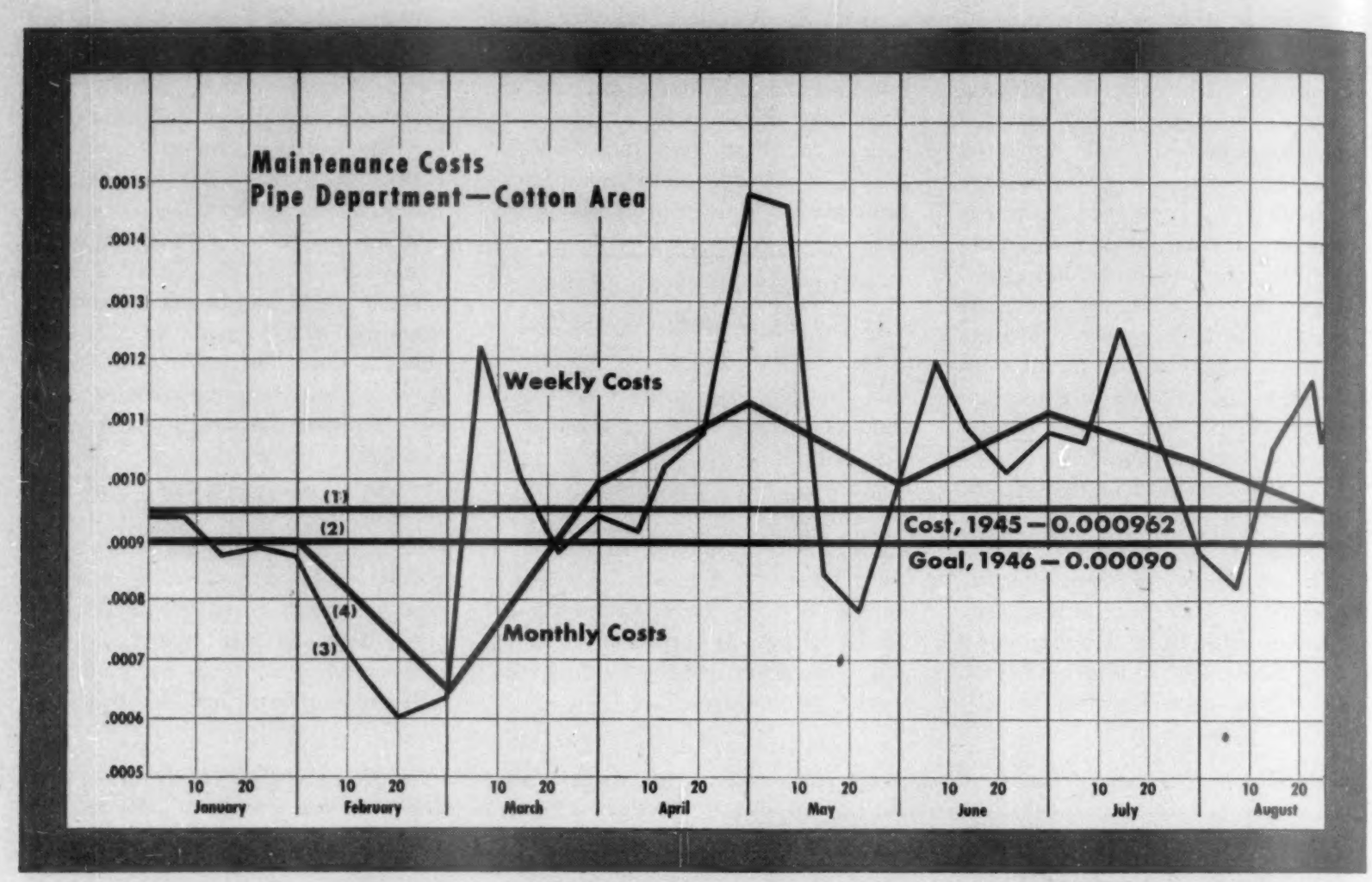
Somewhat similar in principle and development, but for the use of

By assembling (a) forecasts of annual production and (b) related cost estimates of annual maintenance requirements, unit-cost maintenance goals are derived for the entire plant for the coming year. Realization figures for the previous year are used to guide decisions

Determination of Maintenance Goal

(1)	(2)	(3-5)			(6)	(7)	(8)	(9)
	UNITS	DOLLARS per UNIT						
CODE	PRODUCTION 1945	GOAL 1945	ACTUAL 1945	SAVINGS OR LOSS 1945	EXPENDED 1945	ESTIMATED EXPENDITURE 1946	ESTIMATED PRODUCTION 1946	GOAL 1946
X-15	32,000	0.550	0.520	0.030	$16,650	$15,000	34,000	0.442
X-25	32,000	.480	.476	.004	15,250	14,600	34,000	.430
X-35	32,000	1.650	1.544	.106	49,500	46,100	34,000	1.360
X-45	32,000	1.850	2.098	.248	67,000	63,200	34,000	1.850
X-55	16,500	.900	.942	.042	15,500	15,000	20,000	.750
X-65	25,000	.700	.855	.155	21,300	21,000	32,000	.660
X-43	32,000	.150	.115	.035	3,680	3,270	34,000	.097
X-405	53,000	.200	.178	.022	9,500	9,900	54,000	.184

NOTE: Above figures are hypothetical and demonstrative of method only.



Actual performance versus goal in maintenance costs is shown by weekly and monthly progress curves on gang charts posted on the bulletin boards of maintenance workshops for foreman, lead men, and workers to see. Separate charts are kept for each maintenance craft

the maintenance executives and supervisors in checking their own performance in meeting the established goals, are the so-called "gang" cost charts. These charts are posted on the shop walls of the various crafts to show each craft how it is meeting the bogey.

Separate charts for each maintenance craft are provided for all but two or three of the manufacturing areas where maintenance costs are only a minor percentage of the whole. Also, each chart is limited to cost statistics for that one area. A portion of one of these charts is illustrated above. It shows four curves: (1) Actual unit cost of craft maintenance in that area for last year, (2) unit-cost goal for the new year, (3) weekly unit cost, and (4) monthly unit cost. The weekly and monthly curves are progressive and not accumulative.

These costs are plotted on finely ruled commercial graph paper, 9x17 inches in size, showing days and months for a whole year as abscissas, and 150 scale divisions, more than enough to show changes in unit costs, as ordinates. It is to be noted that the figures for the new gang goals are not identical to those of the operating executive, although derived from the same basis. His goals represent the unit costs of the combined maintenance crafts, and for this purpose they must therefore be subdivided to show unit costs for each craft.

This is done by the maintenance engineer after he has established the over-all goals in conference as explained. He subsequently reviews with the maintenance foreman of each craft the maintenance requirements he has received in these conferences, and together they break down the estimates of labor and material costs for each area according to craft. From these costs the unit gang costs are calculated by the same formula — estimated craft maintenance cost is divided by estimated production to get unit gang cost. The old and new gang goals are then shown by the straight horizontal lines across the chart.

It is mainly in the comparisons afforded with actual performance that the value of the "gang" cost chart lies. Each week a maintenance clerk obtains the necessary basic cost figures on performance from the accounting department, calculates unit gang costs, and extends the weekly curves on the various charts kept on the shop bulletin boards. Each month the monthly unit costs are similarly calculated for extension of the monthly curves.

No claim is made that these goal and gang chart procedures are the whole answers to problems of maintenance efficiency and economy. That they serve toward these ends there is little doubt. As their use progresses, undoubtedly the techniques now employed for cost analysis of past performance and in forecasting future maintenance costs will yield to refinements and improvements which will make these data even more valuable to management, production, and maintenance executives. In fact, already an annual summation of maintenance costs, interpreted into unit-cost statistics as used herein, is keeping these executives well posted on the trends in cost of plant maintenance.

VESTIBULE SESSIONS SET THE STAGE FOR QUICKER ON-THE-JOB TRAINING

MARVIN R. COLLINS • FACTORY TRAINING OFFICE, THE B. F. GOODRICH COMPANY, AKRON

On-the-job training is made far easier, both for the learner and for the teacher, by concentrated 3-day vestibule training given new employees in The B. F. Goodrich Company de-icer department.

Groups are limited to between five and eight members. The shift foreman of the de-icer department starts the meeting with introductions and a 15-min. talk on safety and departmental policies. The floor foreman who conducts the 3-day session begins by asking: "Fellows, what are your objectives? What is it you want to gain from your employment here at B. F. Goodrich?"

Invariably he gets the same answers—*money, security, personal safety, avoidance of mistakes, a day's production with a minimum of effort.* The men are then informed that the purpose of the program is to help them get these things, but they must be willing to develop a mental and physical efficiency seemingly above their normal performance. Each man is then asked individually if he is willing to make such an effort to get the things he wants. The answers have always been in the affirmative.

They are informed of the great number of operations they must remember if they want to accomplish their objectives. They all agree they would like to know an easy method of memorizing. The learners are asked to describe a person they know well and as they have last seen him. Then they are asked to put dunce hats on these subjects and have them wave their hands wildly. It is pointed out that they can recall still or moving pictures, or cause pictures they have never seen to appear in their minds' eyes. This isn't new to most people, but too few have consciously connected mental pictures with a definite attempt to remember.

AIDS TO MEMORY

They are taught also to develop the three laws for memorizing: (1) Vivid impression, (2) association, and (3) recall and repetition. Learners warm considerably to this subject, and are anxious to try it on the job.

Agreement is reached among the learners that a job is usually as difficult as the number of things they have to remember. They decide from their experience that it is at least twice as hard to "unlearn" as to learn (i.e., the mental confusion and effort required to decide each time between a wrong and a right way). The foreman then develops this possibility on the board: If the men learn the 1500 de-icer-building operations improperly, they will have to learn the 1500 proper operations before they finish their learning period. Furthermore, the "unlearning" of the 1500 improper methods will be a tax on their minds equivalent to 3000 additional operations. The three laws of habit formation are discussed: (1) Decision of will, (2) emphatic start, and (3) never to let an exception occur.

Proper work habits can only be developed with certainty through a

TRAINING ON THE JOB (shown here) in the Goodrich de-icer department was preceded by three days of concentrated vestibule sessions. See photographs on the two following pages

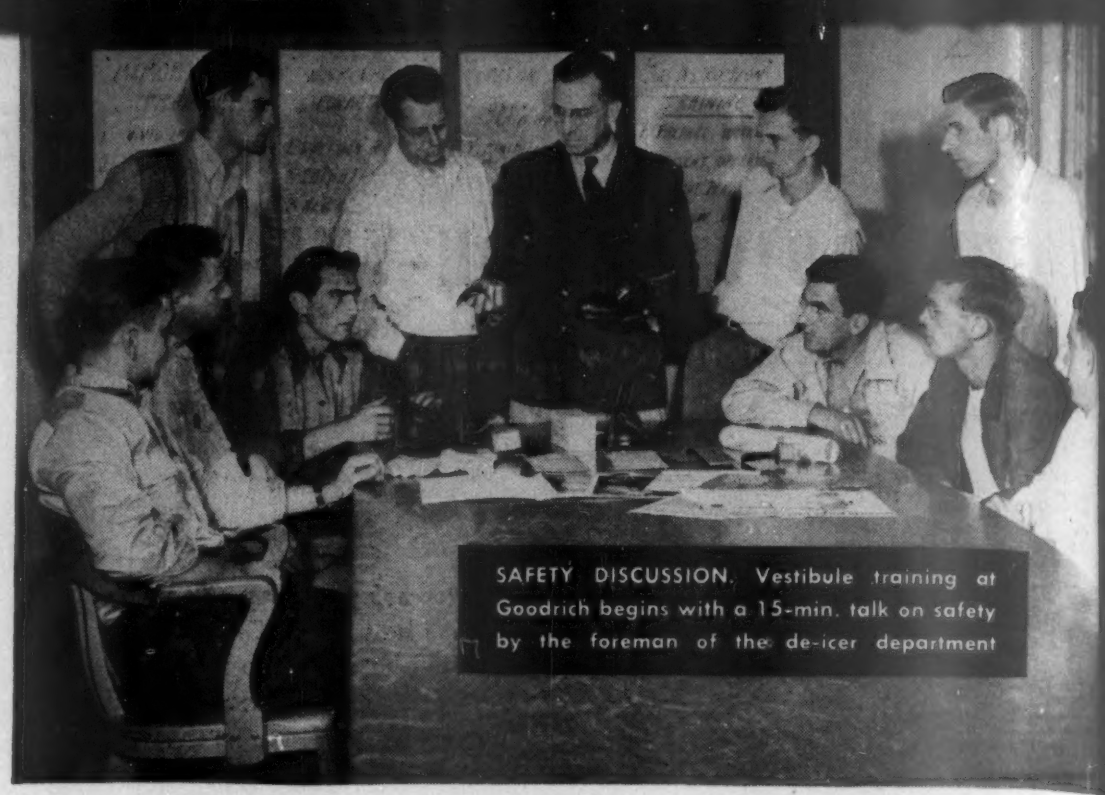
conscious knowledge of motion study. Most operations in building de-icers, therefore, are analyzed in these terms. The group then develops its own definition of the subject. One group developed this one: "It is the elimination of lost time and ineffective or wasted movements so as to produce a maximum of quality work with a minimum of fatigue."

Few instructors, even though trained, stress motion study or habit formation as they should. Those who do an excellent job would have better results if the learner knew how to receive instructions. For this reason the learners are shown the difference between good and poor job instruction. A simple operation is demonstrated without explanation. Then the job is carefully analyzed in respect to describing the operations, purpose of materials used, properties of material, tools and how used, proper perspective, standing position, function of left hand and right hand, the point upon which to focus the eye, and the coordinate operation.

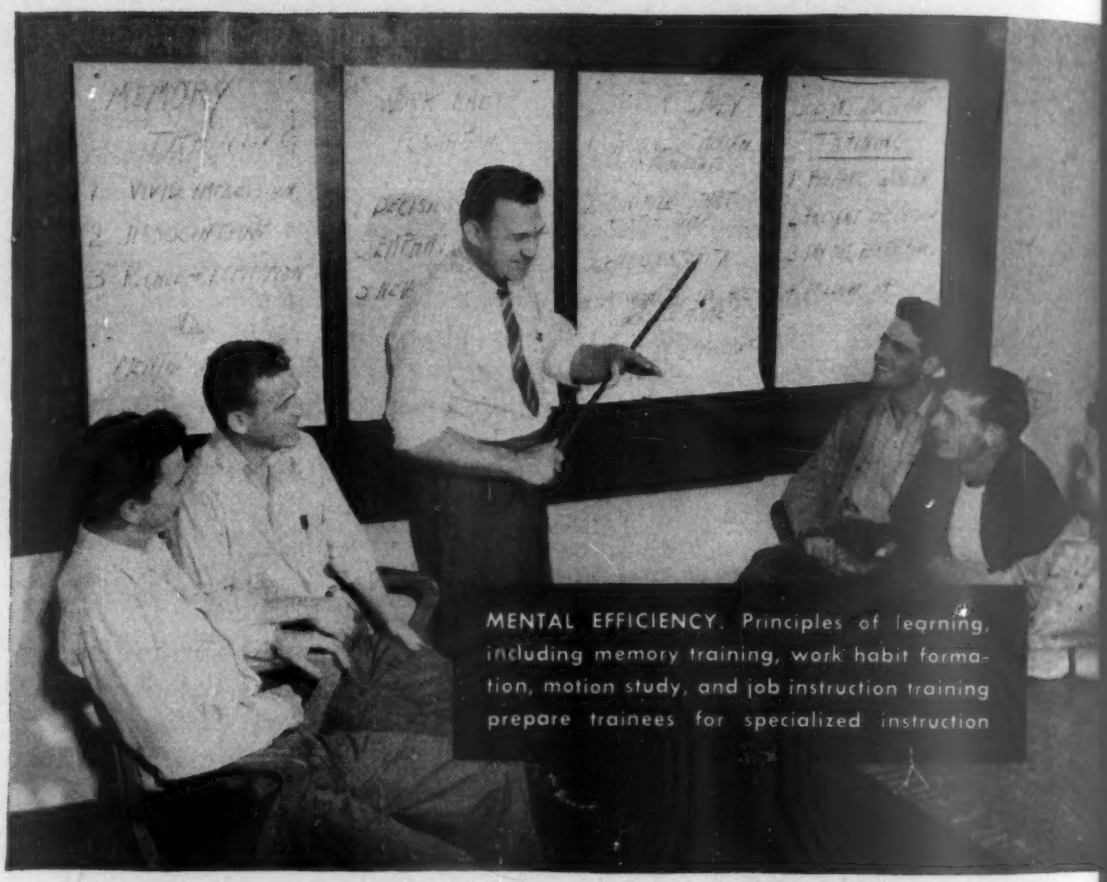
MENTAL PICTURES

The learners are asked to apply their training in receiving instructions by observing the instructor and the operation. They are to ask questions when things are not clear, and to use their knowledge of motion study and habit formation to make the job of memorizing as well as the physical operations easier. They are asked individually if they will use the mental picture method of reviewing after each major operation on the first de-icer, and to visualize themselves performing the operation. They are also to observe their own application of motion study and habit formation as well as the operations they are performing. They are asked to review mentally the entire de-icer before each of the major operations on the second de-icer they build. Before the vestibule training used this method of memory training, many were unable to remember the complete sequence of operations after 60 days on the job. Now it takes only 10 to 15 days to memorize it.

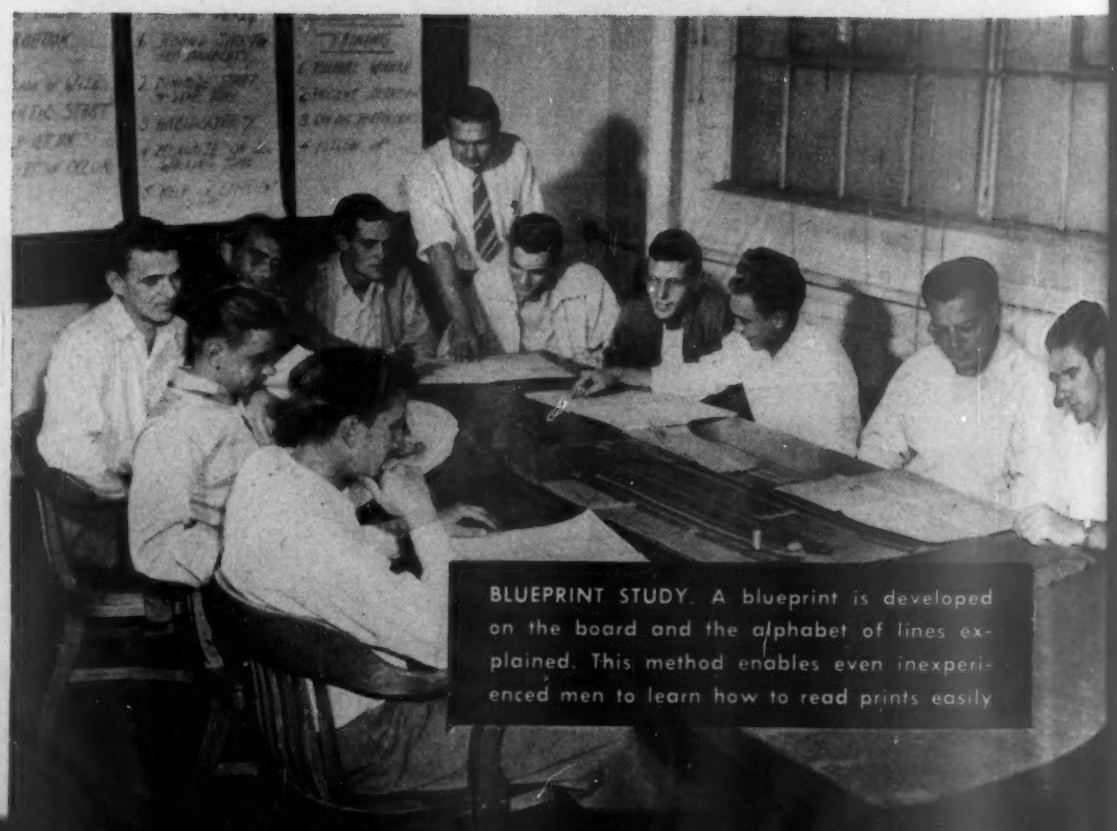
A relatively short time is required for the foregoing discussions. Next



SAFETY DISCUSSION. Vestibule training at Goodrich begins with a 15-min. talk on safety by the foreman of the de-icer department



MENTAL EFFICIENCY. Principles of learning, including memory training, work habit formation, motion study, and job instruction training prepare trainees for specialized instruction



BLUEPRINT STUDY. A blueprint is developed on the board and the alphabet of lines explained. This method enables even inexperienced men to learn how to read prints easily

the learners are given a thorough discussion of ice formation on aircraft, the function of the de-icer, and de-icer installation. Booklets, films, and actual de-icer mountings are the props used.

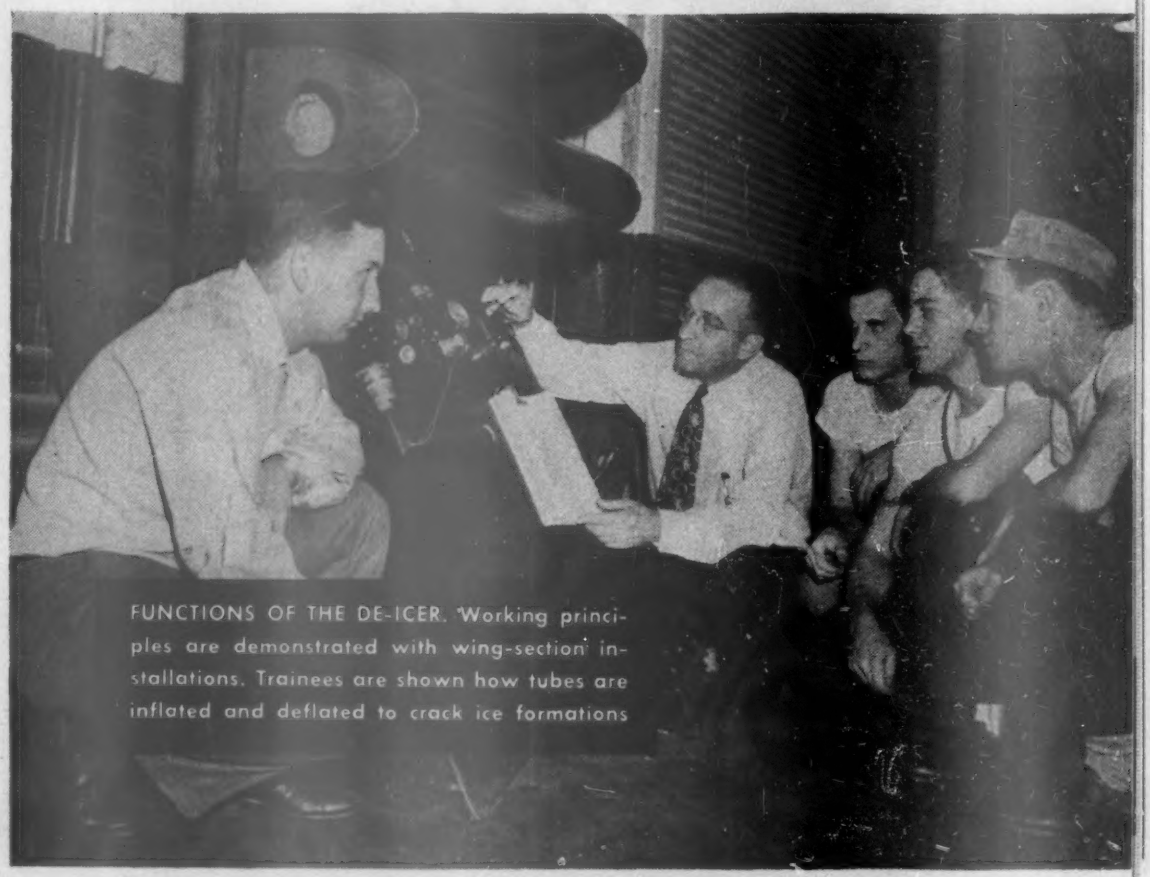
A good background in de-icer operations makes it easier for the learners to learn the nomenclature and construction of the product. This learning is made easy by a "knock-down" de-icer (a small de-icer made up of individually cured parts). The learners assemble and disassemble the knock-down de-icer many times, naming the parts as they do so. In case the name of a part slips their mind, a nomenclature panel nearby has de-icers mounted with exposed sections. Each element is labeled. The learners are asked to use the mental picture method of memorizing construction, sequence of operation, and names of parts.

ON-THE-JOB TRAINING

A Walt Disney pilot training film, demonstrating de-icers, is shown as a final send-off from the vestibule training program. Following this the learners are escorted through the department, and each operation that has been discussed and shown in facsimile is now observed for the first time. The learners are then placed in charge of instructors who have been taught JIT by the educational department, and trained under a carefully planned de-icer-building program following conventional on-the-job training methods.

After a few days on the job, the learners usually volunteer this information: They never worked so hard in their lives as during the vestibule training program, nor ever learned so much in so short a period of time. And later they are thankful because it really did give them the things they discussed the first day—money, security, personal safety, avoidance of mistakes. And it also enabled them to produce a day's work with a minimum of effort. The teachers claim they have much less difficulty in giving instructions and that the de-icers built on the training program are as good as the best made by experienced builders.

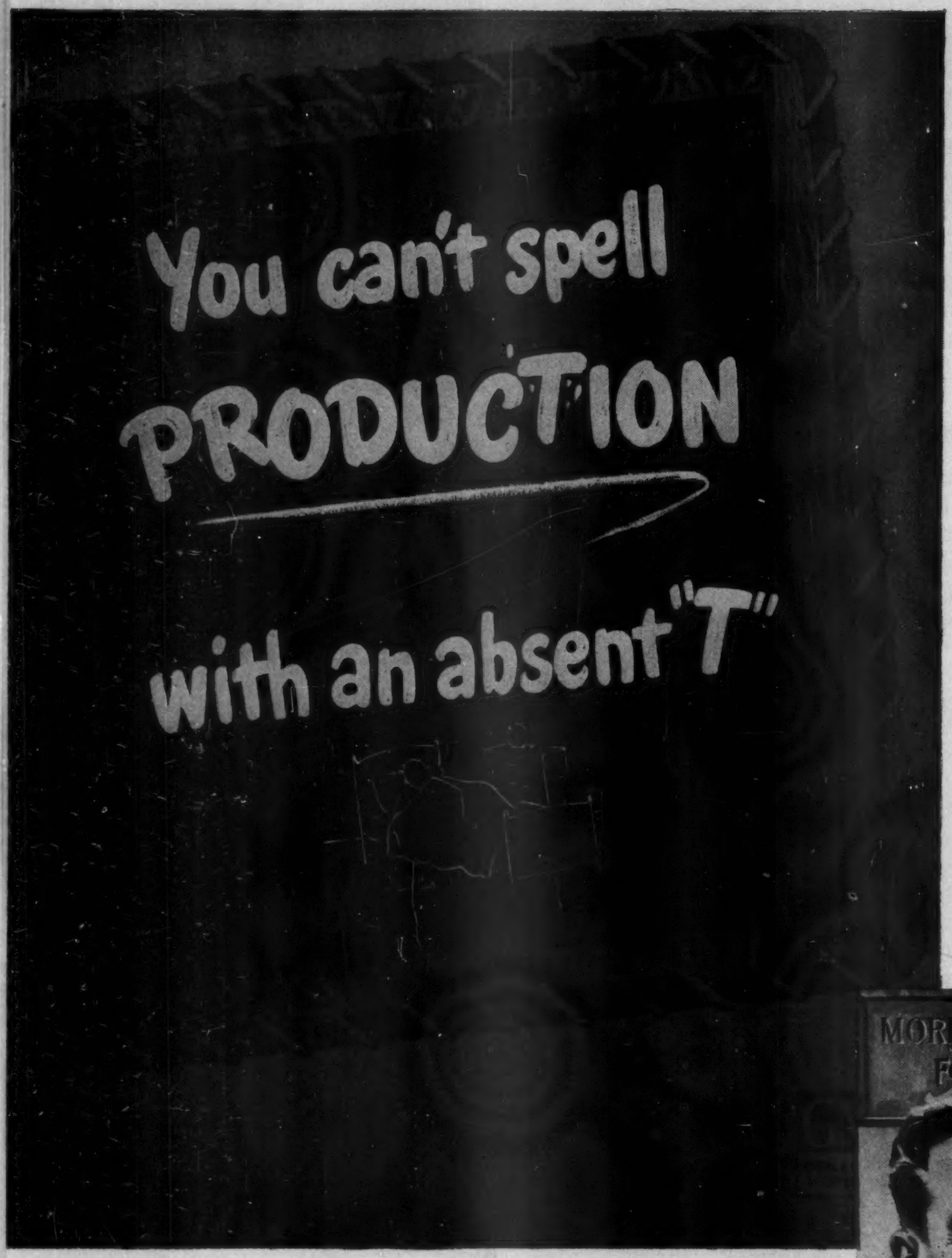
DE-ICER NOMENCLATURE. Trainees see the printed names of many parts so that they will learn nomenclature quickly and correctly



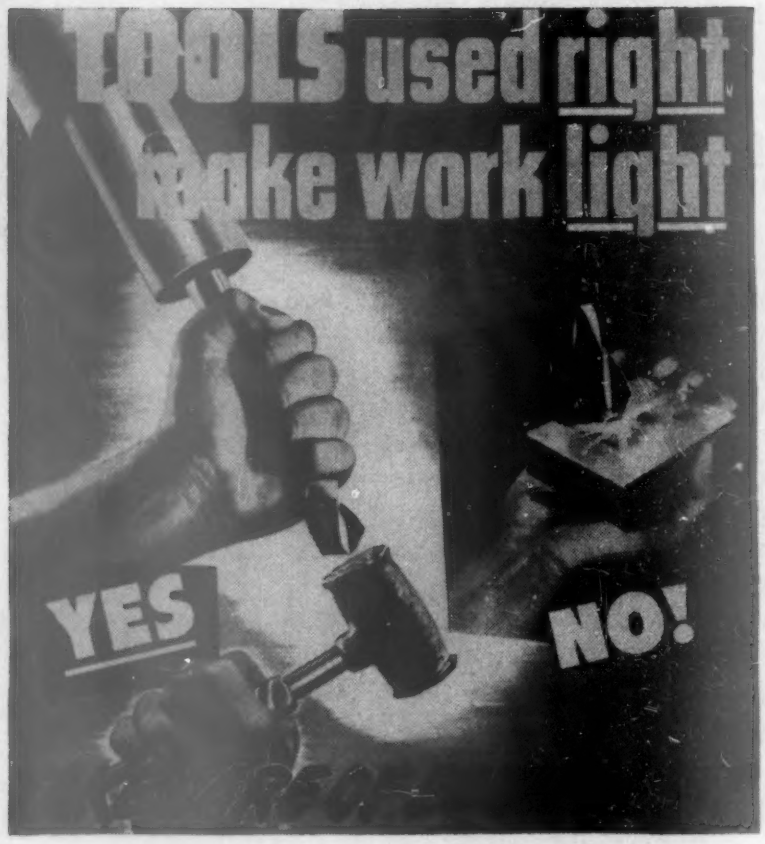
FUNCTIONS OF THE DE-ICER. Working principles are demonstrated with wing-section installations. Trainees are shown how tubes are inflated and deflated to crack ice formations

THE KNOCK-DOWN DE-ICER. Trainees learn construction and nomenclature of the de-icer by assembling and disassembling this model

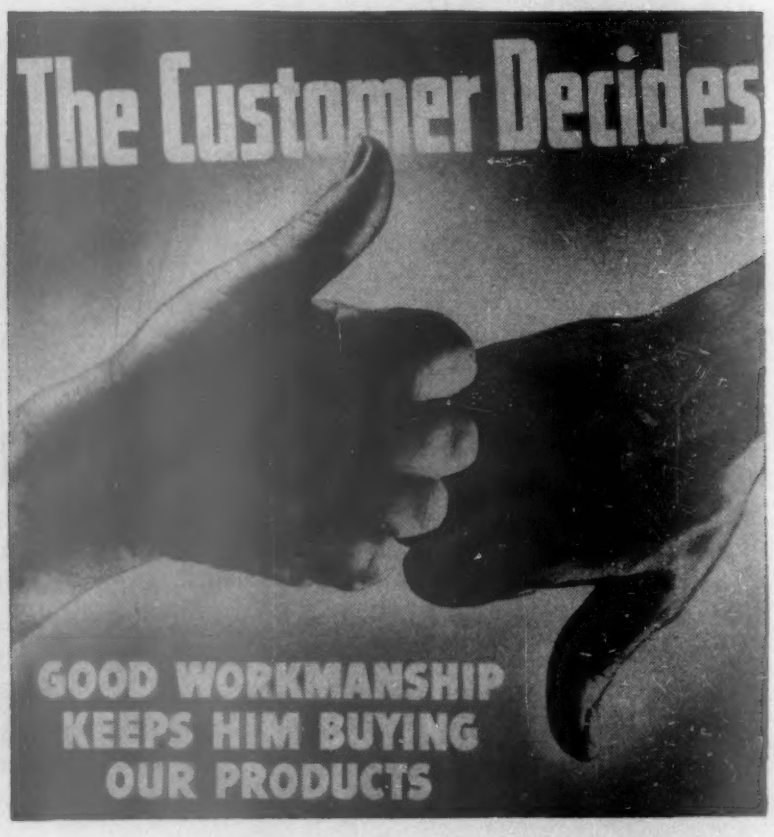
POSTERS AIM AT GREATER PRODUCTIVITY



One good way to transmit basic economic information to employees is through the use of bulletin board posters. It is one of the methods chosen by General Motors Corporation, which has offered a series of thirteen posters, one for each week in the first quarter of 1947, to its many divisions. Posters are in full color, 17x22 inches. Messages are short and to the point, can be read and digested in the quickest glance. Posters shown here are all on the general theme: *High Productivity Will Benefit Everyone.* Other posters in the series will be reproduced in a coming issue.



Transmission of the economic facts of life to employees is a "must" today in every industrial organization



BOTTLENECK CHARTS GET FIRST JOBS DONE FIRST

JACK BATSON • PRODUCTION MANAGER, KITTINGER COMPANY, BUFFALO

Bottleneck charts have broken the back of the production control problem at the Kittinger Company. Scheduling, control, and follow-up are accomplished with just two forms, forms that provide also all the necessary information for the telltale charts.

An important phase of bottleneck control is shutting off unwanted production. "Do first jobs first" is the objective, and at Kittinger it is possible to halt production on a piece of furniture practically at a moment's notice—even though that piece has 50 separate parts, all in process at the time.

PRIORITY SCHEDULED

Basis of the system is a mill priority schedule prepared weekly by the production manager for the foremen and leadmen in the production departments. Job number, item, and quantity are listed for all orders, arranged according to desired delivery sequence. As all parts for an order are completed, it is crossed off the list. On the schedule shown, then, any parts for order C17-C get priority whenever they form part of the backlog of work that is waiting at a machine or group of machines. If, at a particular machine, there is no work waiting to be processed for this order, the foreman would proceed down the list to the first order for which work is waiting. The priority list is reviewed once a week, and, if necessary, is reshuffled to meet changed requirements. The numbers in the second column indicate the sequence in which the orders will appear on next week's schedule.

The so-called tracing record is the heart of the control process. As each part progresses through its assigned operations, a black line is drawn through the machine number in the "operation number" column.

An additional element of control is introduced by the blue line that appears above machine numbers. This is entered at the time the record is originally made out. If any additional operations were found necessary, the number is entered and they are crossed out with the black line in the usual fashion, but the fact that there is no blue line above that operation is a signal to notify the routing department that this additional operation was found necessary. Conversely, if no black line appears below the blue line, it means that a scheduled operation has been found unnecessary. (For purposes of illustration, an example of each of these "errors" has been entered on the tracing record shown in Figure 2.)

How a furniture factory shows up machines where backlogs are building bottlenecks

When a cancellation is received, or a customer requests a delay in delivery, or a shortage forces an order in production to be temporarily discontinued, the production manager calls the foreman and requests that the order be moved down the priority list to a new position, and all work stopped.

At the same time that the tracing record is moved to its new position, a list is made of the machines currently producing parts for that order. The foreman orders those machines to halt production, and to proceed to the next part on their priority list. At the time of the cease-production order, both the manager and the foreman draw a line on their respective tracing records connecting the ends of the black lines which indicate progress on the order to date. At the top of this line they put the date of the order. If, in entering the daily production, the clerk notices that any black line must be extended beyond a line indicating a stop order, he immediately calls it to the attention of the manager and the foreman.

Since it is possible that a particular machine may produce only one or two parts for some orders, some machines may be producing parts for orders far down on the priority list. Conversely, some machines may still be producing parts for the first priority order. This condition, if not closely watched, results in certain machines becoming bottlenecks and not producing parts in time to meet assembly schedules.

To aid in avoiding this, a weekly machine bottleneck chart is maintained. This chart lists the total number of operations which form the backlog for each machine. The number of jobs that are directly *at* an operation which requires a particular machine is determined by checking the tracing record. If, for example, the number of jobs waiting for machine No. 10 is required, each part on each order that has a 10 in its sequence is checked. The total number of the 10's immediately following the black line is the

FIGURE 1

MILL PRIORITY SCHEDULE

11/15/46

PRIORITY NO.	JOB NO.	REVISED PRIORITY NO.	ITEM	QUANTITY
1	C17-C	20	Knife Block	1496
		21	Knife Block	3220
		22	Knife Block	400
		23	Knife Block	1350
		1	Chifferobe	200
		2	Night Stand	300
		1½	Library Steps	500
		3	Single Bed	280
		4	Double Bed	60
		33	Sideboard	100
		5	Chest	100
		24	Chair	200
		25	Chair	200
		42	Knife Block	1766
		19	Knife Block	1220
		43	Knife Block	3069
		11	Knife Block	3
		12	Knife Block	3
		13	Knife Block	3
20	B307	6	Dresser	150
21	U609	34	Side Chair	500
22	U 09	35	Arm Chair	225
23	B607	7	Dressing Table	125
24	U807	8	Vanity Bench	125
25	U204	32	Wing Chair	150
26	B707	9	Mirror	125
27	B807½	10	Mirror	200
28	D103	36	Dining Table	100

FIGURE 2

TRACING RECORD

DATE STARTED: 11/16/46 NAME: Chair PATTERN NO.: S53A

QUANTITY: 100

12/17

PART NO.		OPERATION NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Back legs	1	24	7	29A	9	8	11	11	11	33	29	26			
Back rail	2	24	7	3	6										
Back stuff. rail	3	24	7	3	6										
Back top rail	4	24	7	3	38										
Back spring rail	5	24	7	3	6										
Side rails	6	24	7	9	13	32	6	11							
Side stuff. rails	7	3	6	11	11										
Arm stumps	8	24	7	3	38	38	11	11	11						
Arms	9	24	7	3	37	11	11	38	9	42					
Arm corner blocks	10	4	75	9	8										
Front legs	11	4	24	4	8	9	11	29							
Front rail	12	24	7	3	38	11	11								
Front corner blocks	13	24	7	25	8	11	11								
Back corner blocks	14	24	7	25	8	11									

Two forms (above) provide all data needed for bottleneck-buster (bottom right). Revised priority list in Figure 1 is based on cancellations, shortages, and bottlenecks shown by chart. For example, week of 8/26 shows machine number 1 must perform "next operation" on 25 orders. Circled areas in Figure 2 denote examples of how tracing record is self-correcting for scheduling errors; a break in either blue or black line on a completed order is telltale signal that schedules must be changed when order is repeated.

backlog of work waiting for that particular machine.

Compiling the complete weekly list is a simple operation. It is merely necessary to check off the number of the machine that follows the lines throughout the tracing records. These totals are posted to a chart of the type shown in Figure 3.

Visual inspection of this chart points out the machines that are creating bottlenecks. Reference to charts for successive weeks shows whether the backlog is increasing or decreasing. When the figures and comparative trends are known, they are studied with a view to remedial action.

WEEKLY MACHINE BOTTLENECK CHART

Week of	Machine Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14
8/26	25	3	36	42	45	7	8	12	18	53	12	21	17	7
9/2	23	4	35	44	40	4	7	10	20	45	12	20	18	5
9/9	20	2	38	47	37	3	5	9	24	43	13	18	16	4
9/16	17	1	39	49	35	2	1	10	27	40	11	17	14	2
9/23	15	0	42	54	32	0	0	8	28	37	10	15	12	3
9/30	11	0	43	56	30	0	1	9	30	36	8	14	11	2
10/7	9	2	46	61	28	0	3	8	33	36	9	12	13	4
10/14	8	5	50	66	26	1	6	10	34	34	10	11	12	3
10/21	6	9	52	73	23	2	7	7	36	32	11	10	11	5
10/28	5	13	54	80	22	4	6	9	39	30	12	8	13	4
11/4	3	16	57	92	20	5	8	5	43	27	10	6	14	4
11/11	0	19	58	89	17	7	9	4	46	25	9	5	11	
11/18	0	22	59	86	16	9	6	7	49	22	7	3	10	

FIGURE 3

Is your plant fighting tuberculosis? Routine chest examinations will ferret out chest diseases in their early and curable stages. Here, what they are doing for one company

X-RAY SCREENS OUT CHEST CASES IN HIRING AND PLACING EMPLOYEES

How important X-ray is to industrial medical departments and to the community, is shown at the Caterpillar Tractor Company's Peoria, Ill., plant.

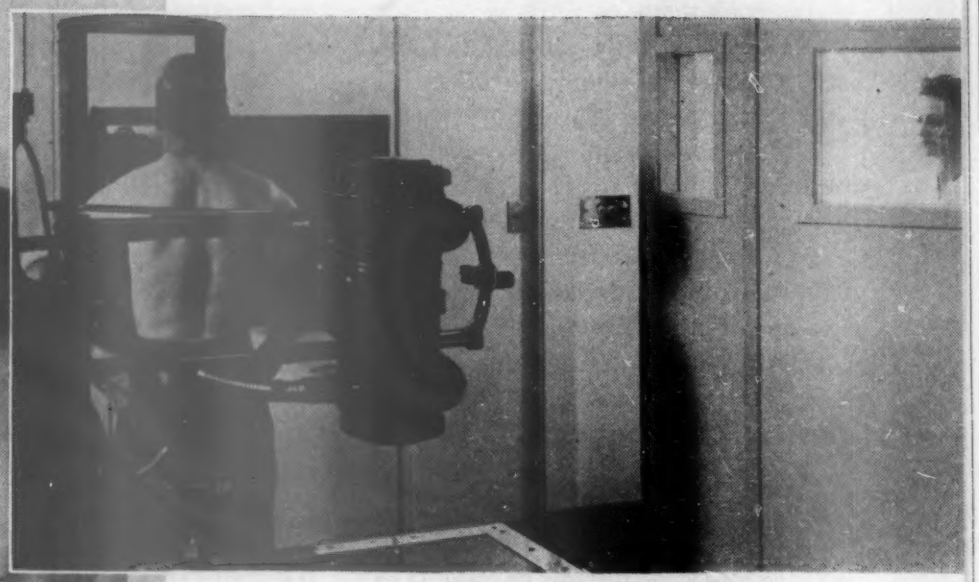
X-ray equipment fits into large and small in-plant medical programs because of its versatile aid in treating a wide variety of ills which may reduce efficiency of personnel.

Its greatest service, however, to Caterpillar—and all industries and communities—is in ferreting out chest diseases, particularly tuberculosis, in their early and curable stages. Without routine chest examination, chest diseases may progress—unknown to the patient—to a point at which cure is either impossible or extremely difficult.

Caterpillar hiring activities at this time throw the advantages of X-ray into sharp relief. Now engaged in a $30,000,000 expansion program, it has been hiring between 60 and 80 persons daily for the past 8 months. Since these people are drawn from a wide area, the firm does its own chest X-ray screening, despite the fact that both the city and county have tuberculosis associations. This heavy expansion requires X-ray for three purposes:

1. To screen out all persons with active chest disorders.
2. To aid in placement of those with inactive chest disorders by determining the precise nature of their disability.
3. To check up on persons working in dusty occupations.

Of course, X-ray serves purposes



Left, how new employees at Caterpillar are given routine chest screening on miniature film X-ray machine. One technician measures chest thickness to determine exposure time; the other adjusts film stand for proper chest height. Above, taking the "picture." X-ray machine operator observes employee through a pane in which glass has been chemically combined with lead to provide protection. Partition is lead-lined

Dr. Harold A. Vonachen, Caterpillar's medical director, examines a radiograph. For large-scale routine screening, the company uses miniature X-ray film because it is easily filed away (right) with the employee's medical record

other than the examination of chests. X-ray helps to locate foreign bodies, diagnose fractures, and perform other functions as a "handmaiden" to medical activities.

X-ray equipment used at Caterpillar includes:

A versatile table on which various types of cases may be X-rayed and fluoroscoped.

A stand especially designed for making life-size 14x17-in. films required for close diagnostic study.

A stand especially designed for the making of stereoscopic pairs of 4x5-in. chest films for routine screening of incoming employees.

Special illuminated units for the viewing of stereoscopic pairs of large and miniature films.

All this apparatus is contained in a completely lead-lined room, 21x25 feet, in one corner of which is a lead-lined partiton separating the operator at the controls from the patient being X-rayed. Just off this room is a small darkroom about the size of a large closet, in which are kept supplies of unused films and chemicals, washtanks, a dryer, a small viewer, and minor accessories. A portion of a small anteroom wall is lined with cabinets large enough to hold 14x17-in. films for two years.

The miniature films require no special storage space. They are merely attached to the employee's record card in the medical file.

Average number of exposures per month at Caterpillar is between 2300 and 2400. About 60 per cent are routine miniature chest X-rays. The rest are used in connection with injuries, for life-size chest studies, and for re-takes. Often several views of the same condition are made, and successive radiographs are taken to observe progress.

The X-ray department, under the present case load, requires the services of three X-ray technicians, who also perform related clerical and developing work and make EKG's and basal metabolism tests.

One major problem in operating such a compact X-ray department is to keep its different activities from interfering with one another. This is done at Caterpillar by taking most new employees between 8 and 11 o'clock in the morning, leaving the rest of the day for injuries and other cases from all three shifts.

Hires are handled in groups and are segregated by sex. One group at a time is asked to remove shirts and undershirts in preparation for X-raying, in an adjoining room.

A skillful operator using a rapid-fire miniature-film X-ray unit can run through a large number in a very brief time. In making the stereo pairs of films, the tube and film shift automatically to position for making the second view. The same tube that is used for radiography of injuries on the combination X-ray-fluoroscopic table is employed also as the source of X-ray for the miniature film stand, and for the 14x17-in. film stand when required. These units, known as cassette-changers, are designed for use with tube-table combinations.

In the case of chest X-rays, 14x17-in. films, as previously mentioned, are taken only of cases indicating chest pathology. The films are read by a plant physician, and suspicious cases are referred to the medical director of the Peoria Municipal Tuberculosis Sanitarium or the Peoria County Tuberculosis Sanitarium, depending on the employee's residence. If medical attention is needed, the patient is referred to his personal physician.

Special attention is given to all persons working in what are classed as dusty occupations—the foundry, grinding operations, heat-treating, welding, machine lubrication, and sanitation, even though the conditions in these departments are better-than-average at Caterpillar.

"Freshmen" Earn While They Learn

DUAL PROBLEM at Westinghouse Lamp Division, Bloomfield, N. J., is to satisfy highest demands for electric lamps in history—while training new employees

SOLUTION is its "freshman" class of operators, most of whom have never been inside a factory before. The new school "graduated" its initial students in 25 days. Girls earn regular pay schedules while they learn. Old way was for new employees to learn assembly techniques from older operators while working alongside them on the floor. Now they learn in school, are able to keep up the pace from the very first day they go on the production floor

management data sheet 1

HOW TO INSURE CLOSE CONTROL OF STORES

1 **Set up an inventory policy** for specific guidance of your storeskeeper.

- Base it upon conditions, finance, and production schedules as modified by sales performance.
- Determine the amounts of inventory desired in each classification.
- Reflect the effect of the other budgets in the inventory budget.
- Break it down in terms the storeskeeper uses and furnish him with a blueprint of what he is to do.

2 **Define the storeskeeper's responsibility** for maintaining stocks at specific levels.

- Furnish him with adequate information regarding purchases, including commitments.
- As production orders are released, have the production department notify him of materials allocated to orders.
- Require him to record quantities on order, quantities allocated, and free balance of stock by items for production materials, and to report periodically the condition of all supplies.

3 **Guard your storeskeeping process** to

Form No. 132 — STORES INVENTORY CONTROL

INVENTORY									RESERVED				COUNT VERIFIED –DATE–
DATE	REF. NO.	QUANTITY RECEIVED	QUANTITY ISSUED	BALANCE	DATE	REF. NO.	QUANTITY RECEIVED	QUANTITY ISSUED	BALANCE	DATE	REF. NO.	QUAN.	V	

reduce losses and employee frauds and collusions.

- Set up an independent check of material received in the storeroom.
- Actually count, weigh, and measure receipts, and check them carefully against purchase orders and purchase requisitions.
- Before entering them upon the records, be sure that stores records are complete so as to show existing balances at all times.
- Maintain a continuous check upon such balances.
- See that requisitions withdrawing materials from stores are carefully computed and entered.
- Review your process to make certain that it is impossible for stores people to steal any materials.
- Require departments to furnish receipts for materials delivered by stores.
- Study your operations to determine whether alteration of stores requisitions (to cover theft) is possible.
- Check the extensions on requisitions. Sometimes interesting frauds and errors are disclosed.
- Prohibit general entrance to storerooms.
- Make sure that your stores are covered by the proper types of insurance.
- Investigate to make sure you have the proper equipment to insure protection of supplies.
- Prevent losses resulting from faulty arrangement of supplies, from dust, dirt, and so on.
- Arrange for slow-moving stock to be brought to your attention regularly so that you can dispose of it with full control of receipts.

4 **Locate storeroom** with due regard to transportation facilities and manufacturing processes.

- Arrange handling facilities to suit materials.
- Give consideration to dimensions, ease or difficulty of handling, how often moved, and quantities in inventory.
- Give particular attention to items requiring special treatment, such as perishable materials.
- Lay out storage space and required aisle space carefully to facilitate quick handling.
- Design the layout and furnishings for most convenient handling.

5 **Devise a workable system of classification** that will permit stores to be quickly identified.

- The use of symbols, generally following the account classification, helps inventory control.
- Number or letter each section and row to denote location and make it easier to find items.
- Use self-counting trays and containers.
- Adopt definite procedures regarding piling, keeping tabs separate and using the old lot first. Teach the need for conservation and economy.

6 **Devise automatic reminders** to reorder which will attract attention in the course of issuing materials and operate automatically when minimum reserve is reached.

7 **Look to your storeskeeper** for economies in production—particularly reports incident to:

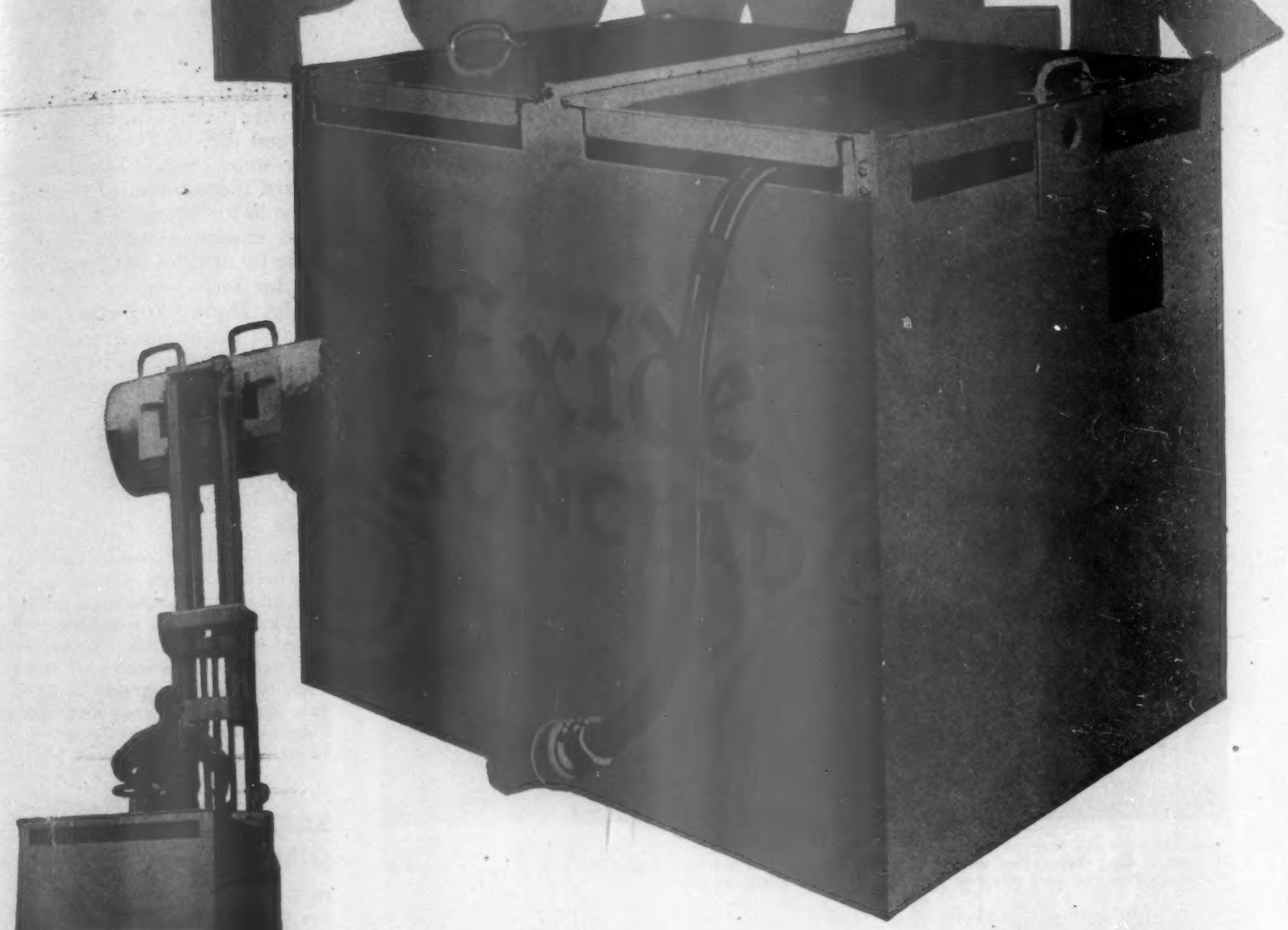
- Eliminating surplus materials.
- Avoiding duplication in orders.
- Reclaiming idle stock.
- Standardization and simplification of supplies.
- Possible substitutes for slow moving supplies.
- Unreasonable use of taps, drills, small tools.

8 **Coordinate stores records** with those of other departments in order to get maximum service.

- See that the storeskeeper is advised through the production department of the production schedule.
- Enlist his hearty cooperation by encouraging him to render reports of stocks on hand which are inactive or suitable only for particular products.
- Have him bring to the production department's attention any item possibly suitable as substitutes.
- Inform the storeskeeper fully regarding maximum and minimum quantities as determined from time to time.
- Have him know the standard economical ordering quantities and issue his requisitions to the purchasing department accordingly.
- Define the ordering point, taking into account time required to get new supplies to maintain the minimum.
- Have the purchasing department furnish him with copies of purchase orders so he will know his requisition has been acted on.
- Advise him of materials coming in so he can arrange his space for them.
- Arrange notification between stores and inspection to avoid rehandling and waste of time.

Prepared by J. K. Lasser, Partner, J. K. Lasser & Company, New York

DEPENDABLE POWER



EXIDE-IRONCLAD POWERED ELECTRIC TRUCKS

CUT MATERIAL HANDLING COSTS

More and more industries are adopting the modern method of materials handling. They are giving the job to the efficient, time-and-cost saving electric industrial truck, which keeps goods moving fast at a steadier rate, with greater safety and at considerably reduced costs.

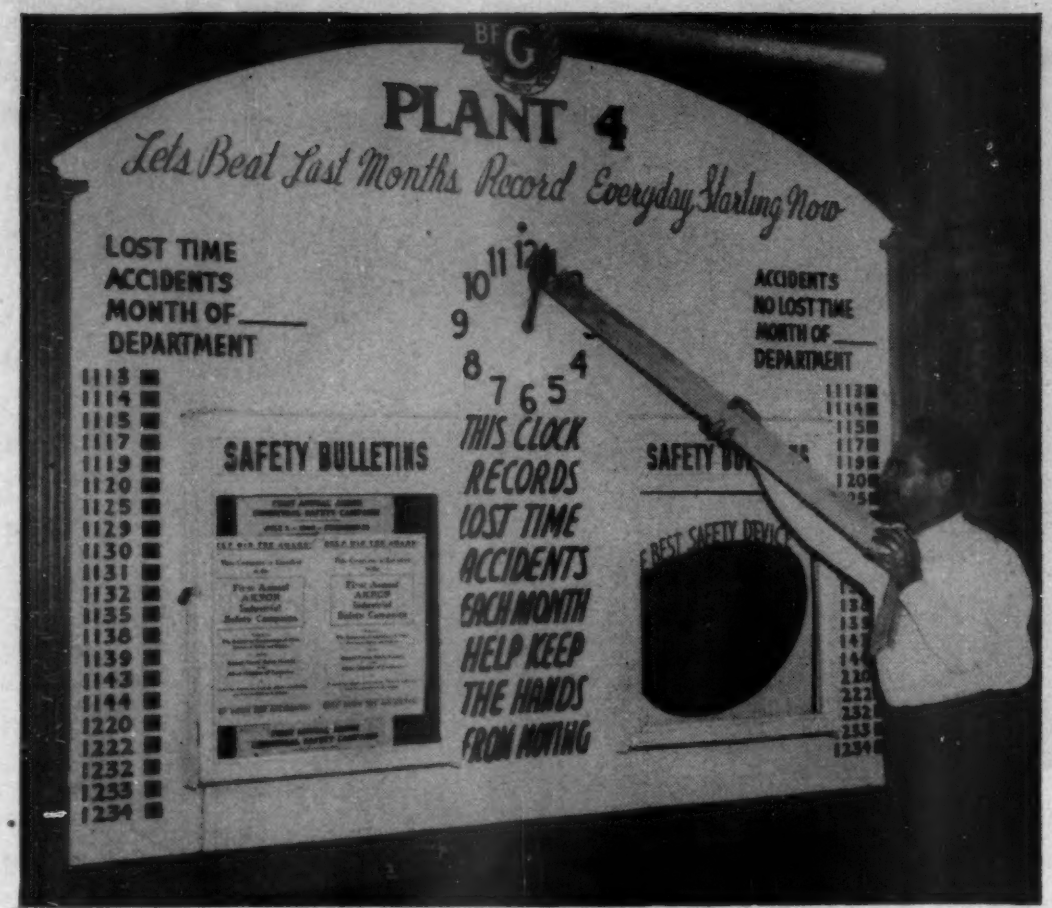
There are battery-electric trucks for every lifting, hauling and handling task. And for each there is a powerful Exide-Ironclad to assure peak performance with full shift availability. Because of their dependability, long-life and ease of maintenance, Exide-Ironclads are used in a majority of all electric industrial trucks.

Write for a FREE copy of Exide-Ironclad Topics which contains "Case Studies" of materials handling problems. Tells how to cut handling costs up to 50%... covers latest developments in handling materials from receiving to shipping.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

operating shorts

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for


PLANT 4
Lets Beat Last Months Record Everyday Starting Now
LOST TIME ACCIDENTS MONTH OF____ DEPARTMENT
ACCIDENTS NO LOST TIME MONTH OF____ DEPARTMENT
SAFETY BULLETINS
THIS CLOCK RECORDS LOST TIME ACCIDENTS EACH MONTH HELP KEEP THE HANDS FROM NOTHING

Hung opposite the main entrance to Plant 4, The B. F. Goodrich Company, Akron, this clock, lighted 24 hours a day, keeps score on lost-time accidents. Both the board and the plant's safety engineer emphasize that the best way to "stop the clock is to stop accidents"

CENTERS BALL BEARINGS WITH SETSCREWS

FRANK COWAN, Chief Engineer, Arnold Bros., Inc., Perry, Iowa

A number of 5-hp., 1750-r.p.m. ball-bearing motors vibrated considerably and became excessively noisy after a comparatively short period of operation. Examination showed a groove just the width of the outer race worn in the cast-iron housing. Wearing of this groove evidently was caused by excessive rotation of the outer race.

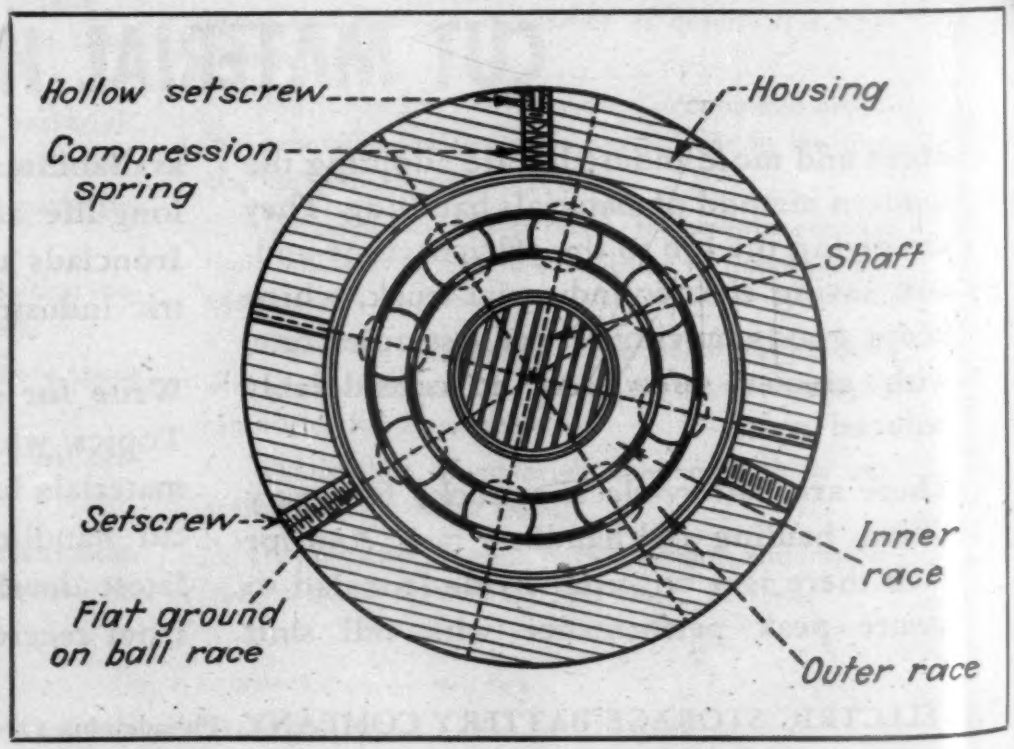
In order to avoid the long delay that would have been experienced in getting new endbells for the motors the expedient shown in the illustration was adopted, and found to work well.

Three equally spaced holes—four have sometimes been used—were drilled in the housing exactly in the center of the width of the bearing race. These holes were then tapped for setscrews.

Shallow flat spots were ground on the face of the outer race of the new bearings at points corresponding to the location of the setscrews. After the bearings had been put in place the setscrews were adjusted until the bearings were exactly centered. Care was taken not to tighten the screws enough to distort the race.

Rotation of the outer race was, of course, prevented by the setscrews but that did not keep these bearings from running satisfactorily and giving normal life.

In some cases it has been desired to retard the rotation of races that are a loose fit in the housing, in order to prevent excessive wear. This has been done by drilling and tapping the housing for setscrews, as described previously. However, instead of grinding flats on the circumference of the outer race, a spiral spring has been inserted ahead of each setscrew. When the screws are tightened the proper amount the springs bear against the race with sufficient pressure to exert the required braking effect.



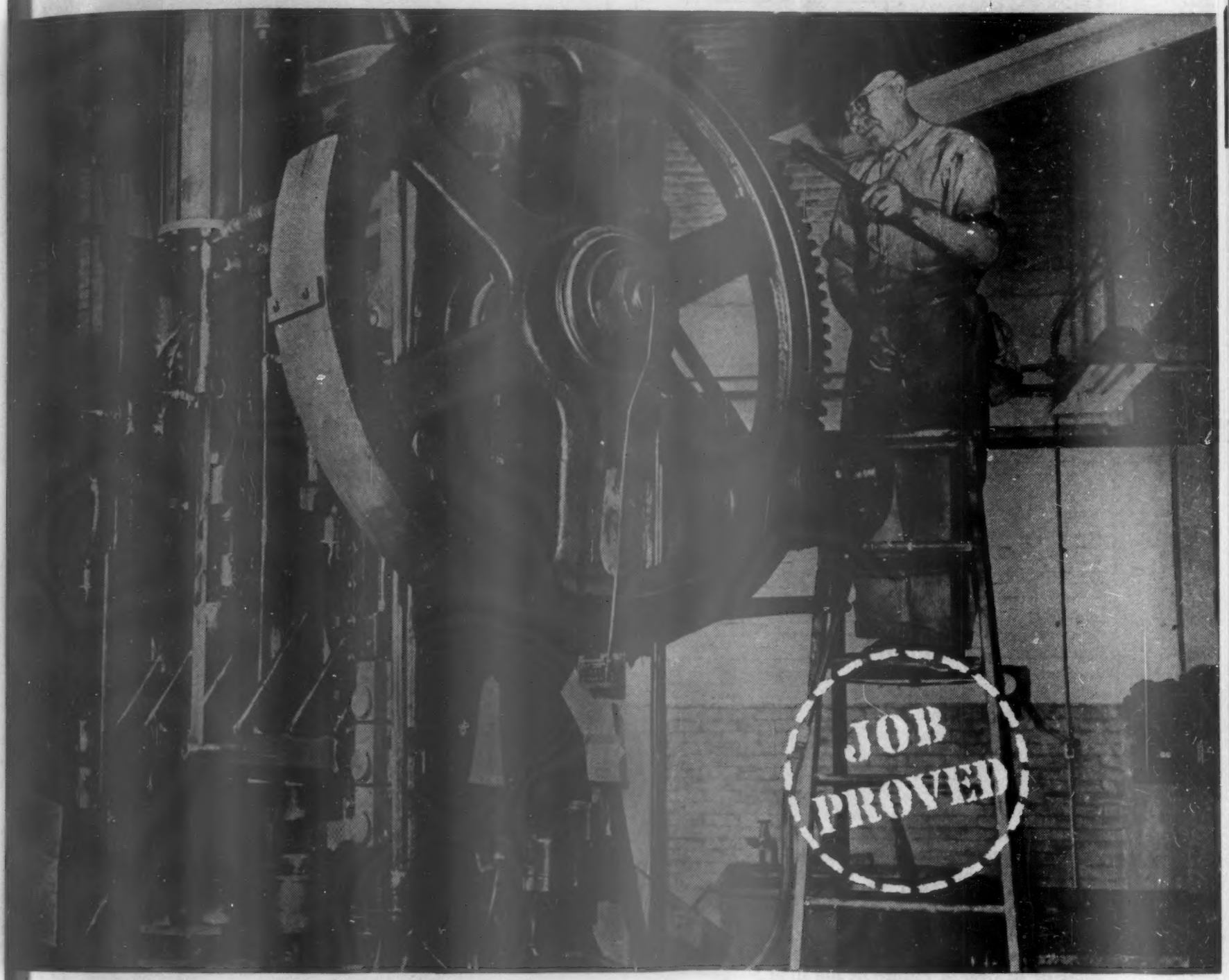
To encourage preparation for future employment, two 4-year scholarships are offered to local high school seniors by Coopers, Inc., a textile mill in Kenosha, Wis. Winners go to the School of Textiles, University of North Carolina, get a cash grant of $500 a year for the four years, and summertime employment at the Coopers plant

SAFEGUARDS PREVENT OILLESS OPERATION

FRED LEOPOLD, Chief Engineer, Lee Rubber & Tire Corporation, Conshohocken, Pa.

Several safeguards at Lee of Conshohocken are insuring proper lubrication of bearings in heavy process machines that depend upon oil recirculation through a separately motor-driven oil

Bringing Down High Maintenance Costs



SUN LUBRICANT...

Puts an End to Frequent Bearing Failures and Shut-Downs, Eliminates 75% of Time Formerly Spent on Lubrication

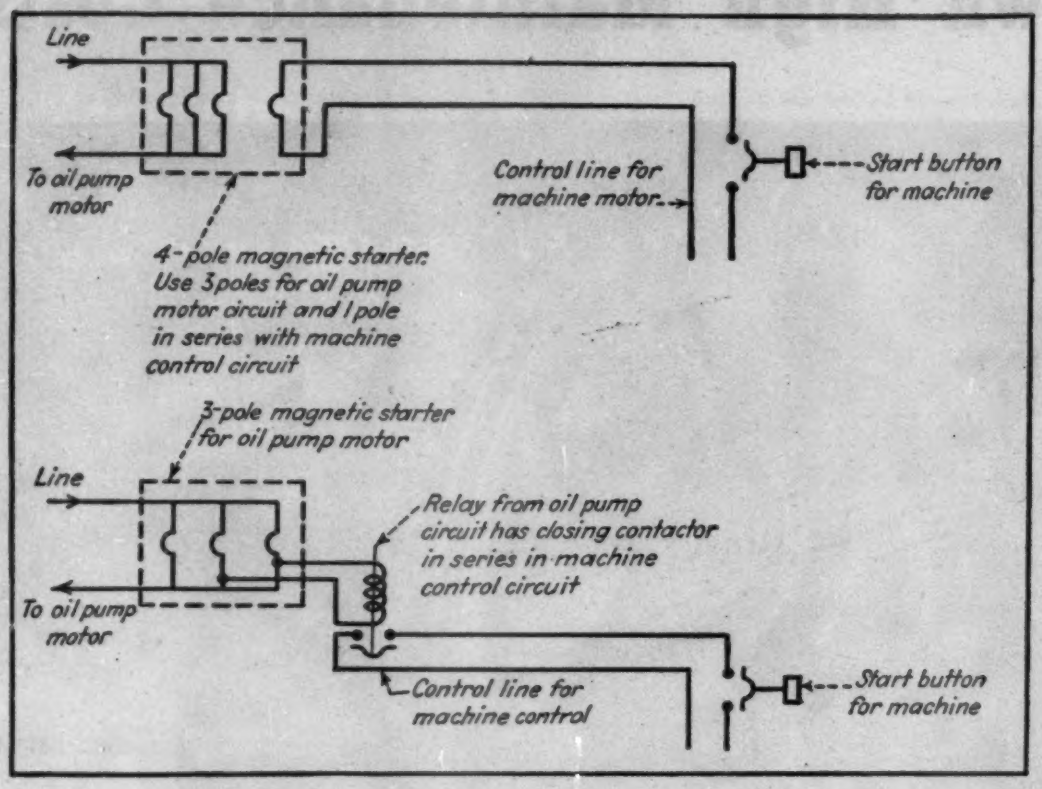
A nationally known manufacturer who uses punch and forming presses was formerly handicapped by frequent bearing failures.

High maintenance costs and mechanical failures, due to lubrication, ended after a Sun Engineer recommended a Sun adhesive pressure grease that had been "Job-Proved" on heavy work in hundreds of plants. This tacky, fibrous grease is used on both gears and bearings, and lubrication time has been cut 75%.

This is just one of the scores of special "Job-Proved" products with which Sun Engineers are helping factories, mills, mines and other industrial plants to cut costs, speed up operations, or improve quality. For lubricants for all types of machinery . . . for Diesel, compressor or turbine oils . . . for hydraulic oils . . . for cutting oils, spirits or other petroleum products . . . call the nearest Sun office today.

SUN OIL COMPANY · ***Philadelphia 3, Pa.***
Sponsors of the Sunoco News-Voice of the Air — Lowell Thomas

SUN
SUNOCO
INDUSTRIAL PRODUCTS


Line
To oil pump motor
4-pole magnetic starter. Use 3 poles for oil pump motor circuit and 1 pole in series with machine control circuit
Control line for machine motor
Start button for machine
3-pole magnetic starter for oil pump motor
Line
To oil pump motor
Relay from oil pump circuit has closing contactor in series in machine control circuit
Control line for machine control
Start button for machine

pump. As a result, this company has saved itself plenty of bearing trouble.

To prevent the possibility of machine operation without "lube motor" operation, and consequent damage to unlubricated bearings, these two power circuits are interlocked as shown by the two wiring diagrams illustrated. Both methods, involving the use of 3- or 4-pole magnetic starters for the lube-motor, are employed. In the newer 4-pole hook-up, where the fourth pole is in series with the machine control circuit, the oil pump must be started before the machine can be operated. Likewise, if for any reason the oil-pump motor circuit fails, this circuit will open, and at the same time will cause the machine control circuit to open and thus shut the machine down.

In the older 3-pole hook-up, using the relay method, the same protective characteristics when starting the machine or in case of failure of the lube motor are obtained. In either arrangement the machine operator must start his oil pump before he can start his machine.

Another safeguard is the use of a pressure switch in the oil pressure line from the pump, which is set to ring an alarm bell should the oil pressure drop below a minimum value. This switch is operated from a small transformer in the oil pump starter circuit so that it will not ring whenever the pump is shut down.

QUIZ ON CONTENTS STIMULATES READERSHIP

E. A. WATSON, Editor, *The Iron Worker*, Lynchburg Foundry Company, Lynchburg, Va.

A questionnaire based on the contents of *The Iron Worker*, the company publication, has been used at Lynchburg Foundry with good effect to stimulate reading of the magazine. This device, adapted from the textbook practice of placing test questions at chapter endings, is designed to point out highlights of the subject matter.

Queries are worded to arouse enough curiosity so that the reader will search out the answer.

The questionnaire page heading simply asks "How well do you read *The Iron Worker*?" Some 20 to 30 questions follow, based on the material covered in the magazine. The answers are not given. They have to be looked for. To make it easy to find the answers, questions are arranged to follow the sequence of the contents. *The Iron Worker* uses the questionnaire as a postscript to point *back* to what is in the issue, placing the questions on the inside back cover. Readers who hurriedly thumb through the pages, skimming the text, may thus find a question which will turn them back for further investigation

TWO-LANGUAGE MANUAL TEACHES SAFE WORK HABITS

Montreal is a two-language city. So the safety manual issued to employees by Dominion Engineering Works is in both English and French. It is actually two manuals in one. Begin in the front and the text is in English. Flip the manual over and the text is in French.

The booklet is pocket size. Head-

Disk wheels are painted automatically at Packard Motor Car Company, Detroit, and the job is done better than when performed by hand. Wheels dip down from conveyor and are sprayed by a battery of guns—three above and two below. Paint is supplied from cylinders on dollies. Wheels spin while spraying, and a water wall picks up excess paint. At a standard production rate of 45 wheels per hours, the work of two men a day is saved

"Sure we've got Wrought Iron Welding Fittings!"

WHEN you need wrought iron welding fittings *you really need 'em!* A good way of getting them is to get the Tube Turns distributor on the phone.

He handles the most complete line of welding fittings on the market, represents the one source of supply on which you can depend for all welding fitting requirements.

Tube-Turn wrought iron welding fittings are a standard part of the line as well as stainless steel, copper, aluminum, monel metal, inconel, nickel, carbon moly, chrome moly, brass. Tube-Turn welding fittings in these metals are available in all necessary weights, in a wide range of analyses, types, and sizes. The complete line of Tube-Turn welding fittings and flanges covers more than 4,000 items. Many of these are in stock with foresighted Tube Turns distributors, in every strategic industrial center, who built up a supply when this was still readily possible.

Write for the name of your nearest Tube Turns distributor and facts about how *the fittings that become part of the piping* serve others in your industry.

TUBE TURNS (Inc.) LOUISVILLE 1, KENTUCKY.
District Offices at New York, Washington, D.C., Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, Houston, San Francisco, Los Angeles.

TUBE-TURN TRADE MARK **tt** *Welding Fittings and Flanges*

ONE SOURCE OF SUPPLY FOR ALL WELDING FITTING REQUIREMENTS

Covers illustrate how English and French sections of this safety manual are printed upside down to each other. Which is the front of the booklet depends on the language worker reads

ings, marginal numbering of safety rules, and simple illustrations are printed in red ink for effectiveness. Safety slogans at the bottom of each page add to reader interest.

ARTICLE DIGESTS SPEED LIBRARY READING

MARTHA HERSHEY, Librarian, Allis-Chalmers Manufacturing Company, Milwaukee

One of the most important functions of the Allis-Chalmers library is the editing of what we call "A-C Abstracts." Prepared at the request of the engineering development division, this monthly publication contains brief resumes of some 350 articles, from 200 or more technical magazines. Sources are listed so that those interested can look up and read the entire article. The "A-C Abstracts" is mailed to company engineers and others interested in technical literature.

SEPARATE POWER SOURCES FOR ELECTRONIC CONTROL

C. E. KOHL, Maintenance Engineer, Harris-Seybold Company, Dayton

Operation of an induction furnace and electronically controlled pot furnaces from the same power source developed a problem for engineers at Harris-Seybold. An induction furnace had been installed for brazing and treating parts, and to eliminate additional processing that had been necessary under previous methods employed.

In the same room with the induction furnace were five gas-fired pot furnaces. When both types of equipment were in use, temperatures of the pot furnaces would rise above the points at which the controls had been set. An investigation revealed that during the operation of the induction furnace, the electronic controllers on the pot furnaces would pick up and open the solenoid-operated gas valves, causing an overriding of the settings on the controllers.

These controllers were then shielded, but this did not eliminate the trouble. Since all furnaces were connected to the same branch circuit, it was reasoned that the high frequency (390 kc.) of the induction furnace must be traveling back in the line to the pot furnace controllers. Accordingly, these controllers were connected to another source, which remedied the condition.

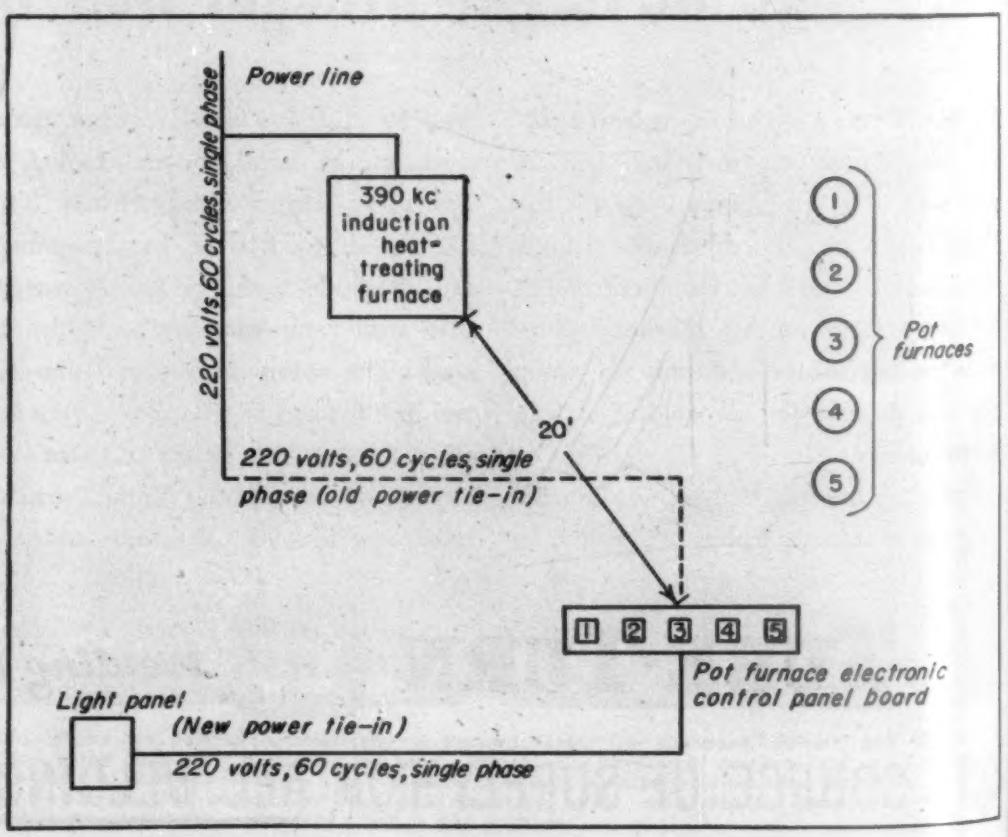
WALL ASHTRAYS HELP KEEP PLANT CLEAN

A. V. LARSON, Assistant Personnel Director, Victor Adding Machine Co., Chicago

Half-circle ashtrays that hook onto the walls are used in the corridors, staircases, and other spots around the plant at Victor. No longer do cigarettes and small bits of paper clutter the floors and stairways. Less sweeping and cleaning are required, and maintenance costs are thus reduced.

Ashtrays, made from scrap steel stock, are neat, safe, conveniently located. They help busy employees in their good housekeeping efforts

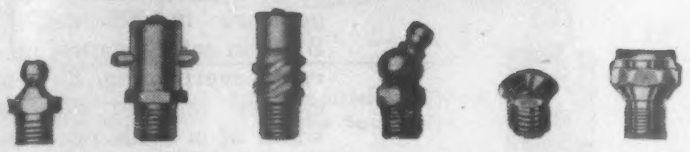
The initial cost of the ashtrays was relatively small for they were made by Victor maintenance men from scrap steel stock. Twice a day a janitor empties all trays, merely lifting the tray up over the screws, dumping it out, and replacing it on the wall.



Alemite offers EVERYTHING needed for INDUSTRIAL LUBRICATION

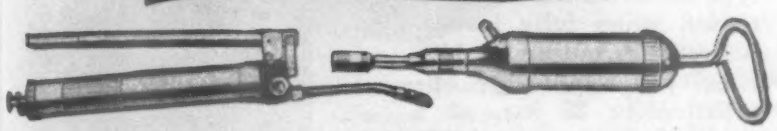
Shown on this page are just a few of the items that compose the huge line of Alemite Lubricating Equipment and Lubricating Systems for Industry. This equipment is the result of many years of experience dealing with industrial lubricating problems—experience that has made Alemite the world's leading specialist in lubrication.

ALEMITE FITTINGS

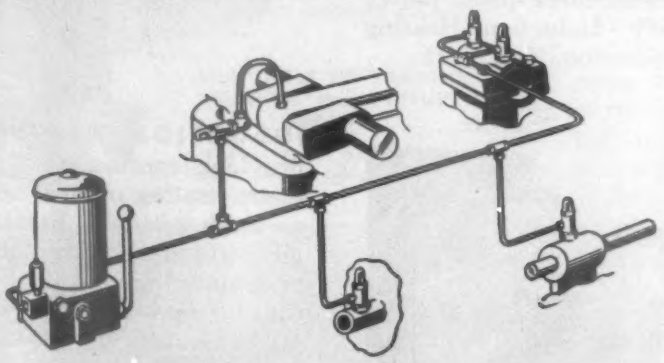


Whatever type of fittings your machines need—hydraulic, pin type, dot, flush, button head, etc.—Alemite has them in all sizes and angles for every kind of industry.

ALEMITE HAND GUNS



The complete Alemite line of hand guns includes push types and lever types, medium and high pressure, for volume delivery of fibrous, heavy and light-bodied greases.



ALEMITE CENTRALIZED LUBRICATION SYSTEMS

These Alemite Systems handle oil or grease. They are designed for either manual or automatic operation. The feeder valves can either be mounted in or away from bearings. To lubricate a machine *even while it is in operation,* lubricant is introduced, at a safe, convenient, central point and forced through metal "arteries" to the feeder valve. These valves discharge a measured amount of lubricant to every bearing in the system. An indicator signals when the job is done. Hundreds of bearings can be positively, safely lubricated from one point. Human error is eliminated. Lubrication costs are reduced. Time, money and men are saved. Shutdowns are ended and production is increased. The over-all savings can enable you to amortize an Alemite Centralized System in as little as 3 months.

THERE ARE FOUR ALEMITE SYSTEMS

Each is adaptable to almost any type of machine, large or small, new or old. Have one or all 4 systems demonstrated right at your desk with transparent working models.

ALEMITE HAND PUMPS

All necessary equipment—gun loaders, gear pumps, volume pumps, etc.—for transferring, handling and applying all petroleum products. All Alemite equipment is ruggedly made for heavy duty work.

ALEMITE PORTABLE LUBRICATION UNITS

The line includes the Alemite LUBRIKART—a complete, compact portable lubrication department on wheels for dispensing oils and grease.

Also, the Alemite electric power gun for high pressure lubrication. 25-lb. capacity tank. Handles all types of light-bodied lubricants.

ALEMITE POWER PUMPS

5344 . . . is a volume delivery air operated transfer pump for semi-fluid and light-bodied lubricants. Transfer from original 400-lb. drum.

Heavy duty barrel pumps for volume delivery of lubricants from original drums. Models for high or low pressure—for handling oil or grease.

ALEMITE

REG. U.S. PAT. OFF.

Industrial

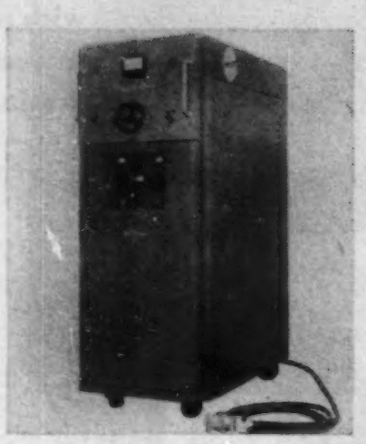
LUBRICATION EQUIPMENT

Another Product of STEWART WARNER

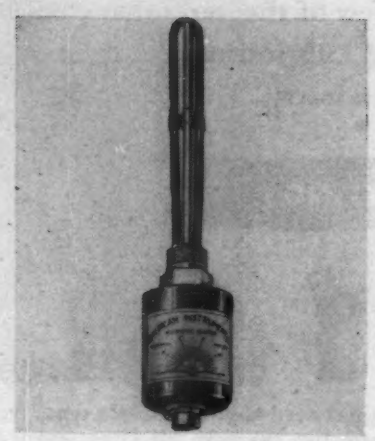
1870 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

electronic and heating equipment

Introduced to you during the past 12 months in the department, What's New in Equipment, is reviewed here to give you a quick one-year summary



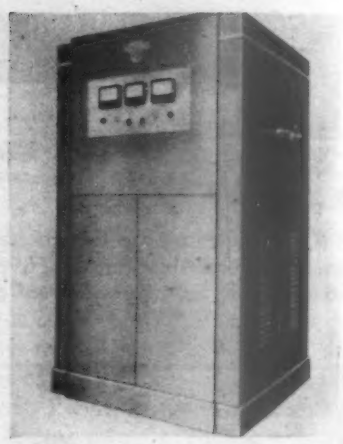
DIELECTRIC HEATER—called Raytherm, generates heat within the part to be treated. With 5-kw. output rating, general purpose Model D5G is complete in one cabinet with dimensions of less than 6x2½x4 feet. Maximum demand from a 230- or 460-volt, 3-phase, 60-cycle line is 13.3 kva. Industrial Electronics Division, Raytheon Manufacturing Co., Waltham, Mass.

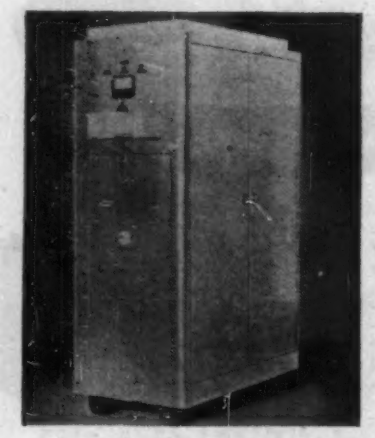


IMMERSION HEATER—when installed in water tanks, drums, pipelines, and similar locations, is said to automatically maintain temperature of liquids within 5 deg. F. of setting, ranging from room temperature to 350 deg. F. Built-in safety control prevents overheating. Element can be screwed into the walls of a tank or drum. American Instrument Company, Silver Springs, Md.

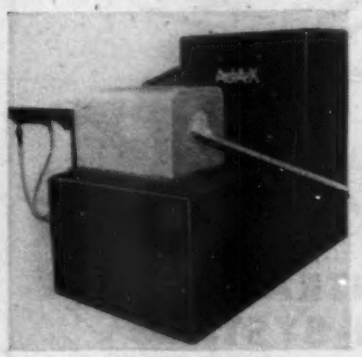
DIELECTRIC HEATER—Electronic heater for plastic preforms operates at 40 megacycles, using a water-cooled oscillator tube. Operating at a high frequency, tube permits use of an average full-power 5-kw. output during heating cycle. Pre-heat cycle is started by a pushbutton station; rest of operation is automatic. General Electric Company, Schenectady.

INDUCTION HEATER—High frequency electronic-type induction heating generator, when fully loaded, delivers an output of 1400 B.t.u. per minute, or approximately 25 kw. at a nominal frequency of 375 kilocycles. It has a full-load input of 50 kva. at 90 per cent power factor, and operates on a 205-245-volt, 60-cycle, three-phase power supply. Induction Heating Corporation, New York.



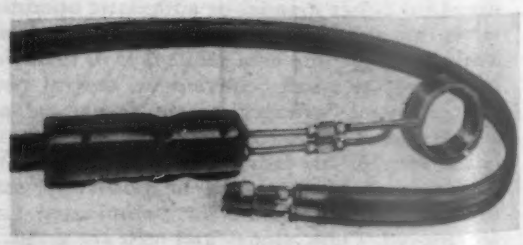


DIELECTRIC HEATERS—Portable Model 88XO Red Head Thermex high frequency dielectric heating unit has an output of 5 kw. delivered at approximately 20 megacycles. Raises the temperature of 4 pounds of average purpose material 170 deg. F. in 1 minute. Has standard automatic dual time controls. Thermex Division, The Girdler Corporation, Louisville.

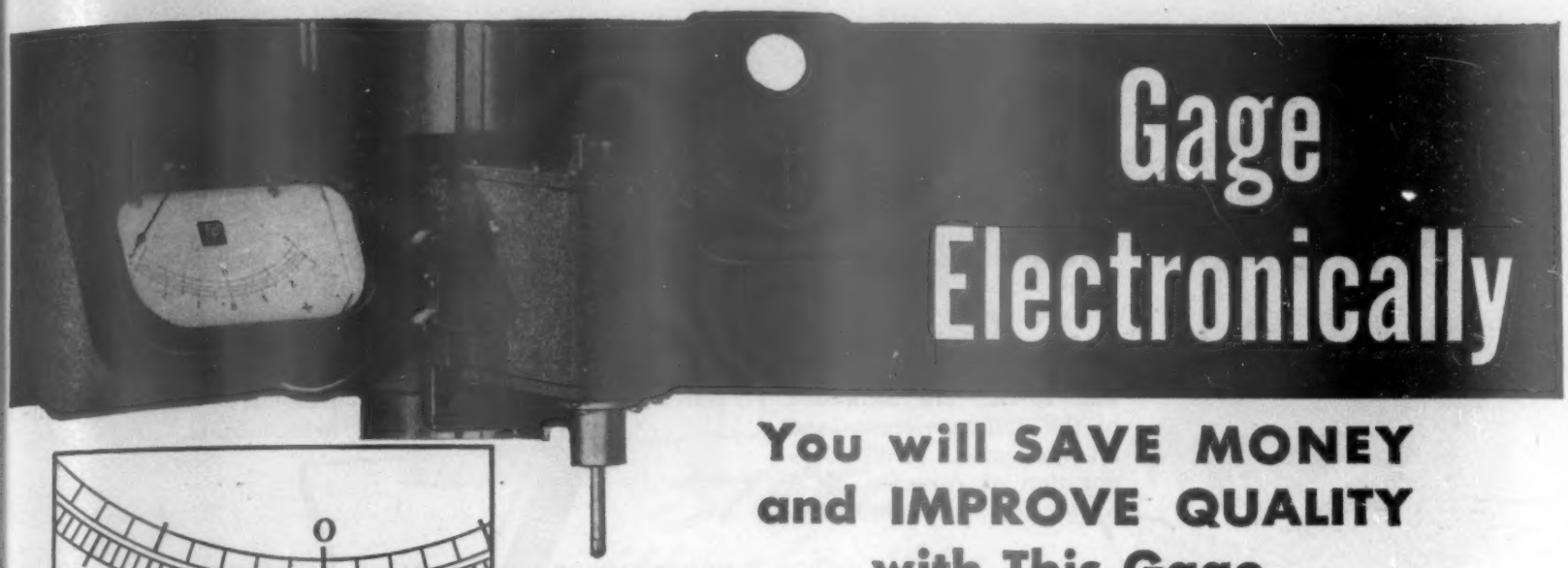


INDUCTION HEATER—provides continuous automatic heating of steel slugs or forging blanks. Features an automatically timed pneumatic feeding device. Can be converted from one job to another by changing heating coil, resetting timing device, and adjusting chute. Ajax Electrothermic Corp., Trenton, N. J.

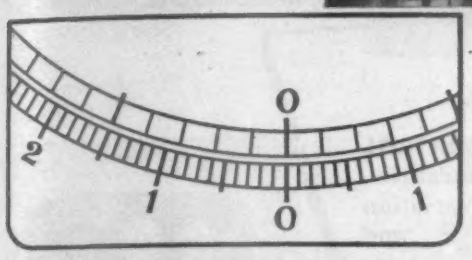
IMMERSION HEATER—Chromalox Type DH electric heater is built for immersion in greases, solid oil, and other compounds in 55-gal. drums or similar containers. Adjustable thermostat limits operating temperatures. Has large circular heating element. Electrical connections terminate in standard conduit box. Edwin L. Wiegand Company, Pittsburgh.



INDUCTION HEATING COIL—Flexible leads for induction heating coil, with grip-type handle, permit heat-treating and brazing parts that cannot readily be moved to fixed coils. Either single or multi-turn coils can handle work up to approximately 4 inches in diameter, with power consumption ranging from 10 to 40 kw. Induction Heating Corporation, New York.



Gage Electronically



Above section shows actual size scales. You can select any one of 4 magnifications. Minimum graduation either scale .0001" and .00001".

FOUR MAGNIFICATIONS on the Same Dial

INSTANTANEOUS LIMIT LIGHTS

One-pass inspection; no maneuvering, no backstop required.

CONTACT PRESSURE Adjustable from 1½ ozs. to 16 ozs.

Greatest sensitivity of any Gage. Overtravel does not harm gaging mechanism.

ADAPTABLE TO VARIOUS MACHINE and FIXTURE SET-UPS

Contact unit and gaging heads can be adapted to suit requirements.

You will SAVE MONEY and IMPROVE QUALITY with This Gage -

It's versatile, exceptionally accurate, sensitive, and very fast

USE this truly Electronic Comparator in both your shop and laboratory. Small shops find this versatility a big asset. You get two gages for the price of one.

In your laboratory, its exceptional accuracy and extreme sensitivity, the highest of any comparator on the market, will enable you to make the most precise measurements. You can check your most accurate gage blocks and masters.

It has a choice of four differently graduated scales. You are not limited to a single scale. You can read any value from .000010" to .003". Minimum contact pressure is only 1½ ozs.

You can take it out into your shop, and with a flick of a switch it is ready to inspect production having any tolerance from the finest you will ever require, to the widest.

Any operator can use it. The tolerance lights obviate the necessity of reading the dial. And he can't hurt it by forcing the contact spindle.

It is adaptable to various set-ups on any machine or gaging fixture.

We will tell you more about it if you will write —

FEDERAL PRODUCTS CORPORATION
1144 Eddy Street
Providence 1, Rhode Island

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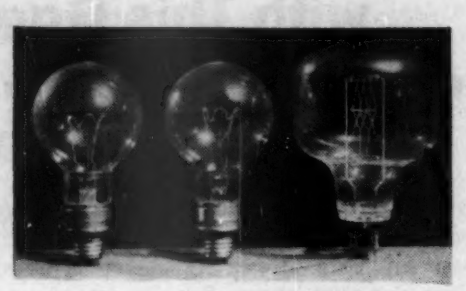
Electronic Gage
MANUFACTURED EXCLUSIVELY FOR

FEDERAL

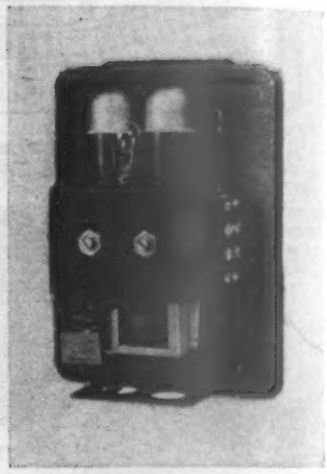
INDUCTION HEATING GENERATORS—Two models of induction-type electronic power generators, of 2- and 15-kw. output, are constructed for localized heat-treating, brazing, and soldering of metals. Converting electrical power from the 60-cycle supply to a frequency of approximately 400,000 cycles per second, the generators, 2-BL and 15-BL, are composed of the main generator and an applicator. Radio Corporation of America, RCA Victor Div., Camden, N. J.

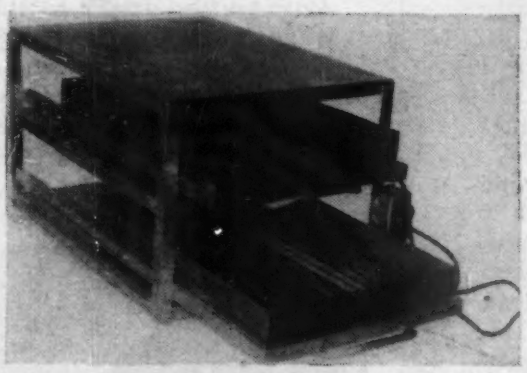
PHOTO - ELECTRIC CONTROLS—said to be unaffected by moisture, high temperature, or humidity, are rugged high-speed units. Photo-tube is available either integral with the housing, or in a small separate housing. Tamper-proof sensitivity adjustment permits positive operation over varying distances between photo-tube and light source. Photoswitch Inc., Cambridge, Mass.



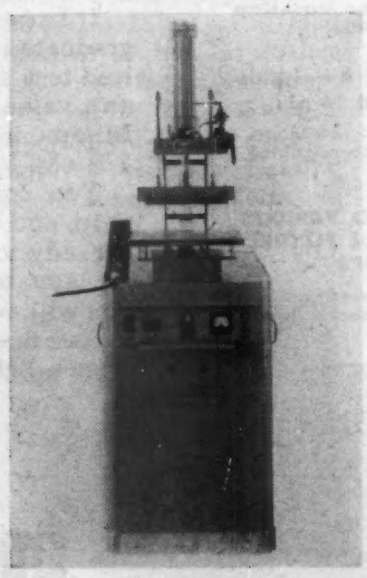
INFRA-RED LAMPS—are made in 250-, 375-, and 500-watt sizes. The two smaller lamps, each with a G30 bulb, for use in open reflector ovens, are interchangeable. Each has a medium skirted base and 5-in. light center length. The 500-watt lamp is equipped with a medium bipost base and 6-in. flexible leads. General Electric Lamp Department, Cleveland.

TEMPERATURE CONTROL UNIT—Close temperature-variation control, variation as low as ⅕ deg. F., and power "on-off" cycles as short as 3 seconds are claimed possible with the Xactline unit. Can be used on electric furnaces employing standard millivoltmeter and potentiometer type controlling pyrometers, or gas-fired equipment using solenoid-controlled valves. Claud S. Gordon Company, Chicago.

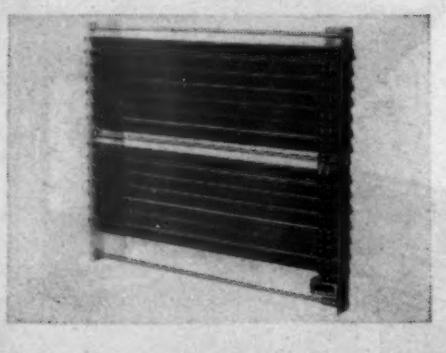




INFRA-RED PREHEATER—for plastic preforms, also can be used for dehydrating industrial materials and drying paints and metal finishes. An Infra-Lectric plate, consisting of aluminum-carbon alloy elements fused into tempered glass, forms the bed of the drawer. Delt-Calesco Company, Far Hills, N. J.

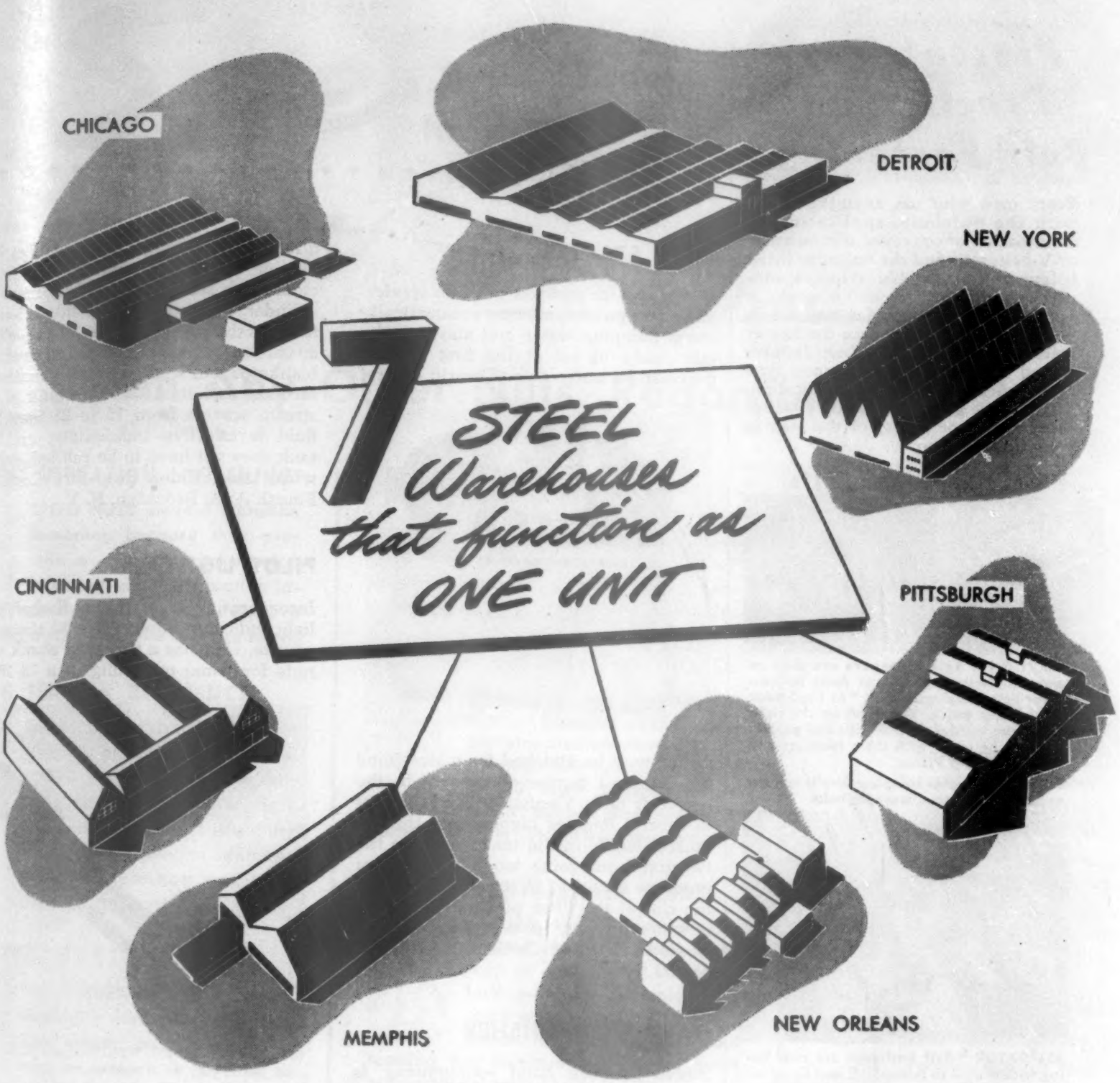


THERMOPLASTIC SEALER—Designed for sealing, bonding, or welding thermoplastic sheets, Type K-3-S, 2½ kw. dielectric sealer produces airtight, waterproof seams. Sealing press may be mounted on the unit and operated by foot controls. Electrical operation is provided by remote control. Has radial-fin, air-cooled tubes, large casters, safety interlocks, pushbuttons, overload relays, circuit breaker, connecting terminals, and calibrated dial. Thermatron Division, Radio Receptor Company, Inc., New York.



OVEN HEATER—Type NOU Modified, operates at oven temperatures up to 950 degrees. Heating element terminals are centralized at one end of the assembly, and all electrical connections are brought to a single box. End brackets of heavy sheet metal are punched for mounting. Edwin L. Wiegand Company, Pittsburgh.

THERMOSTAT—of the remote-bulb type, is for control of temperatures over narrow calibrated ranges. Can be used for liquids or gases, or for metal-to-metal applications, and can be equipped with ambient temperature compensation. Control is based on snap-action switch actuated by a solidly liquid-filled copper thermal assembly. The assembly can be adjusted by either knob or by screwdriver. United Electric Controls Co., Boston.



J&L Steel service warehouses with their ample stocks of J&L Controlled Quality Steel are strategically situated to serve you well. In addition your nearest J&L warehouse has the advantage of being able to call upon any of the other J&L warehouses to fill an unusual requirement for you. They can supply you with flame cut and fabricated steel and many exclusive J&L products such as Junior Beams, Junior Channels, Jal-Tread floor plate and J&L Precisionbilt Wire Rope.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

J&L SERVICE WAREHOUSES

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** Operated by Jones & Laughlin Steel Service, Inc.*

Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

For Conveyor Belts

FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips and patches that can be made with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

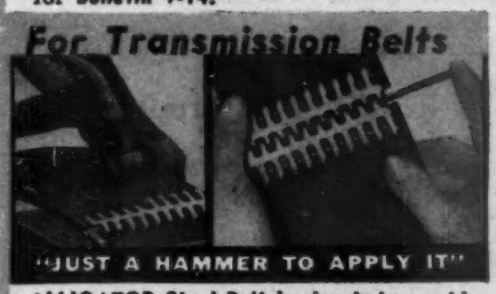
For V-Belts

ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts



ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

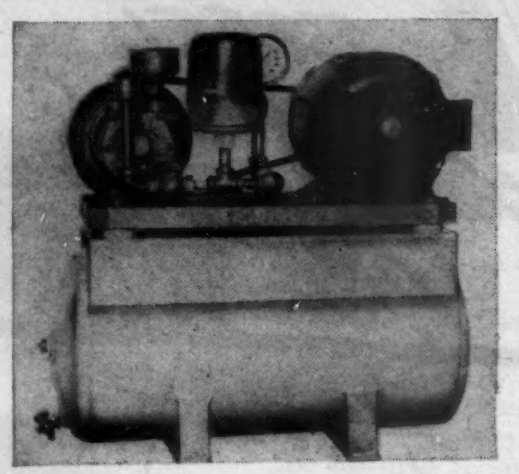
Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.

what's new in equipment

PUMP STARTER

When a water pump is put into service, vacuum priming unit automatically starts pumping water and stays on the job, ready to act at the first sign of decrease in water flow. Electric control



switch may be attached for maintaining the required degree of vacuum in the reservoir tank. Vacuum relief valve, set to several degrees higher than the required degree in the tank, prevents the vacuum from going too high. Vacuum units are furnished in sizes depending on the size of the lifter pipe, actual height of water lift, and the time limit. Leiman Bros., Inc., 110-83 Christie St., Newark 5, N. J.

HAND EXTINGUISHER

Stored-pressure hand extinguisher is said to be as easy to use as a garden hose. Suspended by a shoulder sling, the tank is out of the way, permitting free use of both hands. The hose attachment enables the user to attack a fire in any direction. The fluid, consisting of carbon dioxide combined with carbon tetrachloride, is shot as a fine spray from the cylinder, and is converted into a heavy, fire-smothering gas. Fires of oil, ether, or gasoline, as well as electrical fires, are blanketed and snuffed out in a matter of seconds, maker states. The bulk of the stream travels from 15 to 25 feet. The fluid is effective indefinitely, and the tank does not have to be refilled, except when used. Union Stop-Fire Corp., 30 Fourth Ave., Brooklyn, N. Y.

PILOT LIGHT

Incorporating a self-timing flasher, pilot light indicator blinks 60 to 80 times per minute. Unit has a threaded shank with nuts for panel mounting in a 13/16-in.

diameter hole. Flashing is produced by a sealed, glass-enclosed thermal unit of the hot wire type, which provides a positive snap action make-and-break. Current consumption of the unit, including

Speed Nuts*

Give You More Assembly Advantages

Than Any Other Nuts, Regardless of Price

EVENT VIBRATION LOOSENING

SPEED NUTS prevent vibration loosening because they provide a *double* spring-tension lock that *absorbs* vibration instead of merely *resisting* it. Insures a tight attachment for the life of the product.

RING TENSION RESILIENCY

In the assembly of porcelain enamel, plastic or glass parts, SPEED NUTS provide the tension necessary for a tight assembly, yet are sufficiently resilient to prevent damage due to expansion and contraction, vibration or shock.

PLIED FASTER

SPEED NUTS put wings on your assembly lines because they start easier, pull down faster and no wrench is required to keep them from turning. Made for use with coarse-thread sheet metal screws, requiring fewer turns to fasten, for still faster application.

MINATE LOCK WASHERS

You can boot lock washers out the window, for SPEED NUTS are self-locking. They cut both material and handling costs. Because of their wide bearing surface, SPEED NUTS also can eliminate the need of spanner washers.

SELF-RETAINING

Many types of SPEED NUTS lock themselves in screw-receiving position for "blind" location assembly, eliminating expensive welding, riveting or clinching operations.

PERFORM MULTIPLE FUNCTIONS

Like a one man band, many special types of SPEED NUTS perform multiple functions, replacing two or more parts. SPEED NUT prongs can be incorporated in almost any shape or form to do the job easier and faster.

LOCK ON UNTHREADED STUDS

"Push-On" SPEED NUTS need only be pushed over rivets, nails, tubing, or unthreaded studs to lock parts so securely, you can't wrestle them off. Costly threaded inserts, drilling and tapping are eliminated—molding costs reduced—assembly speeded up.

WILL NOT CLOG

Having no threads, SPEED NUTS cannot clog with paint. No assembly delay for re-tapping threads. This is particularly important where SPEED NUTS are permanently attached to parts for blind assembly.

WILL NOT "FREEZE" TO THREADS

Having no threads, SPEED NUTS will not "freeze" to rusting bolts. They can be easily removed at any time for servicing or replacing. You'll save the repair men a lot of cussing.

WEIGH LESS

Because they are made of sheet metal instead of bar stock, SPEED NUTS are in the "featherweight" class compared with threaded nuts. By eliminating lock and spanner washers and other unnecessary parts, weight is reduced still further.

MINIMIZE SHIPPING DAMAGE

SPEED NUTS give you free insurance against shipping damage. They provide a resilient lock that defies loosening and prevents cracking of enamel and glass. With SPEED NUTS, your products will reach your customers in perfect condition.

SEND TODAY

We're not fooling about these advantages. They are very real and worth-while as any SPEED NUT user will tell you. Rush your assembly problems to us now, giving complete details. We'll show you which of the 4000 shapes and sizes will do the trick for you.

*Trade Mark Reg. U. S. Pat. Off.

NADA:
lliece Barnes, Co., Ltd.
milton, Ontario

GLAND:
mmonds Aerocessories, Ltd.
ndon

IN FRANCE:
Aerocessoires Simmonds, S. A., Paris

IN AUSTRALIA:
Simmonds Aerocessories, Pty. Ltd., Melbourne

MAN PRODUCTS, INC.

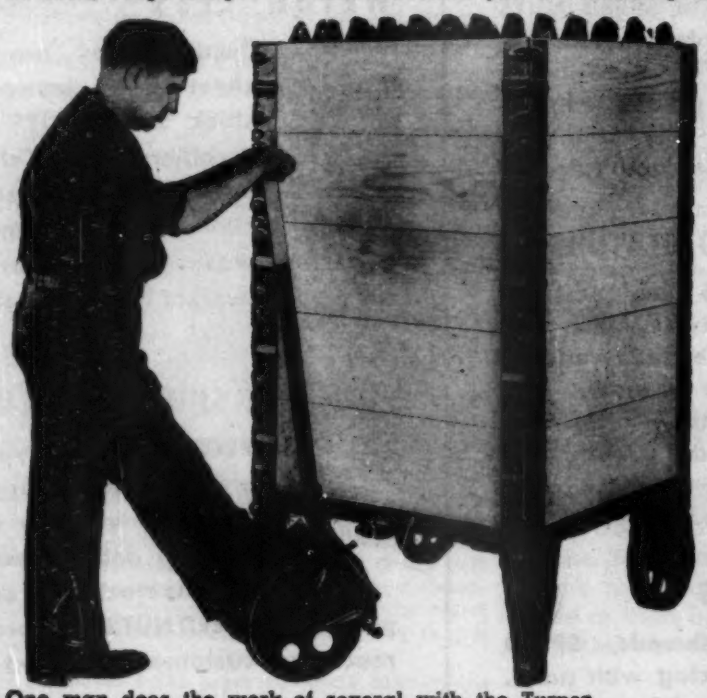
2096 Fulton Road, Cleveland 13, Ohio

You Get Rugged, Enduring Construction PLUS the Utmost in Efficiency When You Use

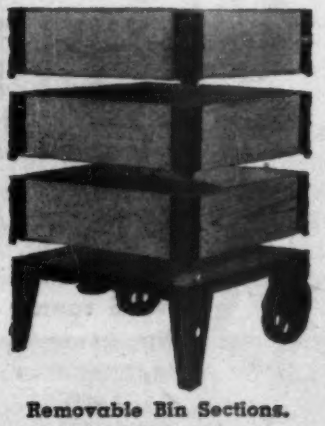
THE TURNER SYSTEM OF MATERIALS HANDLING

Turner Equipment is REALLY RUGGED—it's built to stand up and "take it" during years of hard, rough usage . . . and still serve just as efficiently as when it was new. That's why your investment in the TURNER SYSTEM from the standpoint of EQUIPMENT will pay big dividends.

But frankly, your investment from the standpoint of EFFICIENCY will pay BIGGER DIVIDENDS! For more than a quarter century we have been providing the complete, co-ordinated TURNER SYSTEM OF MATERIALS HANDLING which has cut LABOR, SPACE and EQUIPMENT COSTS up to 50% for many American manufacturers.

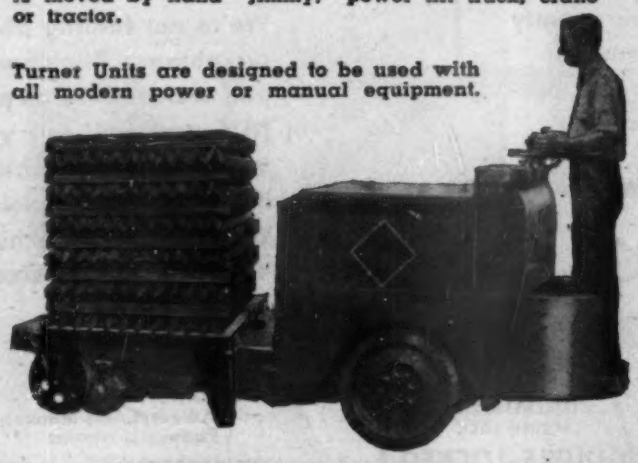


One man does the work of several with the Turner System—because you can "DELIVER THE BIN AND SAVE THE HANDLING." Bin Sections, Racks, Section Trays, Die Tables fit on the Turner Transport which is moved by hand "Jimmy," power lift truck, crane or tractor.



Removable Bin Sections.

Turner Units are designed to be used with all modern power or manual equipment.



60 DAYS' FREE TRIAL

You may see for yourself how the TURNER SYSTEM works in your own plant. We are willing to ship an assortment of standard units on 60 DAYS FREE TRIAL. Send for them at once. Keep them for two months. Return them if they don't do the job. The trial costs you nothing except transportation charges. Write today asking us to send this assortment to you. Complete information will follow immediately.

A twenty-page book completely outlines the Turner System and is sent without charge to established companies. Write on your letterhead for your copy.

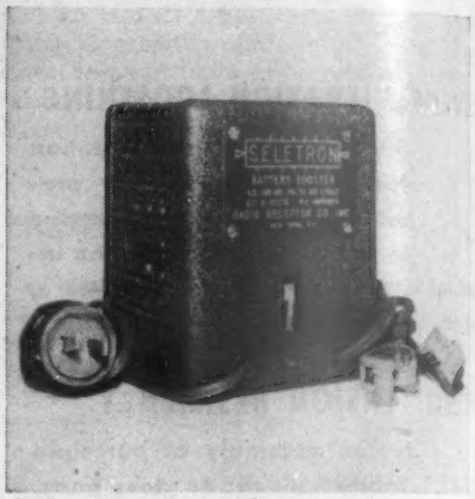
FACTORY SERVICE COMPANY

4605 N. TWENTY-FIRST ST. MILWAUKEE 6, WISCONSIN

lamp, is 200 ma. It operates on d.c. to 32 volts, or a.c. to 125 volts. On 125-volt a.c. an external resistor of 500 ohms, 25 watts rating is required. Engineering Associates, 380 Main St., East Orange, N. J.

BATTERY CHARGER

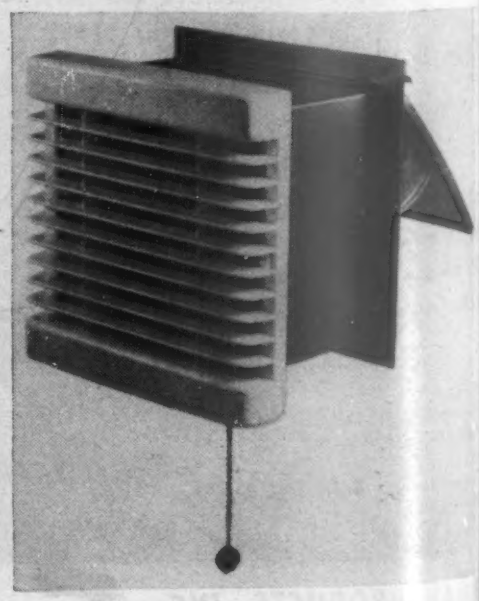
Lightweight, automatic, constant voltage battery charger is designed for industrial plants using single 6-volt storage batteries for the operation of alarm or signal systems, control apparatus, or similar applications. Although rated at 4-2 amperes, the unit can supply 5 amperes for a short time. Featuring slow



charging that protects battery life, the battery booster operates without expendable parts. Selenium rectifier and automatic circuit breaker provide constant output voltage and overload protection. Unit operates on 105-120 volts a.c., 60 cycles; d.c. 6 volts, 4-2 amperes. Seletron Div., Radio Receptor Co., Inc., 251 West 19th St., New York 11.

VENTILATOR

Known as Aeropel, ventilator is adapted to installation in either old or new construction. The white plastic grille can be attached with the bars in either horizontal or vertical position. Tubeaxial Ventura fan consists of 3-bladed aerocurve propeller driven by an enclosed 115-volt, 60/50-cycle single-phase motor. A resilient spring mounting attaches motor to cylindrical air tunnel. Wall box



BELT LIFE INCREASED 133% BY AMERICAN ECON-O-MATIC DRIVE

The American Econ-o-matic Drive illustrated, powers a line-shaft operating a group of cotton linters.

Until seven years ago, the line-shaft was powered by a constant-tension drive with the 100 H.P. motor mounted on slide-rails. The drive proved troublesome—requiring new belts every three years.

Installation of an American Econ-o-matic Drive solved this belt-life problem. *It increased belt life 133%.* Instead of requiring replacement after only three years of service, the belt is still in good condition after seven years of trouble-free operation.

American Econ-o-matic Drives provide this kind of low-cost, trouble-free drive operation because they *match belt tension to the load.* They harness the load-controlled torque reaction of the motor to increase and decrease belt tension as the variations in the load require.

Write today for a copy of the American Econ-o-matic Drives Handbook. It explains the unique operation of these Drives and contains complete specifications and installation information. Chances are the maintenance costs of many of the drives in your plant could be materially reduced.

The American Pulley Company
4308 WISSAHICKON AVE., PHILADELPHIA 29, PA.

INCREASE PLANT EFFICIENCY...

SPEED PRODUCTION

WITH INDUSTRIAL PNEUMATICS

New Model D "truck-man" equipped with General Industrial Pneumatics built by Yardman, Inc., Jackson, Mich.

If you are *buying* new material handling equipment...

or

If you are *designing* new material handling equipment... know *this* about industrial pneumatic tires!

Industrial Pneumatics . . .

- Move loads faster and more economically.
- Protect floors and floor coverings.
- Provide flotation movement and roll easier over soft ground or rough surfaces.
- Protect fragile, easily damaged loads.
- Eliminate noise.
- Guard against spillage due to shocks and bumps.
- Eliminate jar and shock to operator.
- Are designed for both low speed and high speed duty.

The GENERAL TIRE

Dept. 10
THE GENERAL TIRE & RUBBER COMPANY
AKRON, OHIO

INDUSTRIAL PNEUMATIC TIRE · TUBE · WHEEL UNITS

is of rust-proofed steel with insulated weather door that has an automatic latching mechanism. Fan starts automatically when door is opened, and stops when door is closed. Capacity is 400 c.f.m. American Blower Corp., Detroit.

CLAMP TRUCKS

One-man clamp trucks, made in five models, complement the work of power-lift trucks in moving materials. At base of trucks are short, powerfully tipped "arms" which are said to lift loads weighing up to 600 pounds. Trucks are

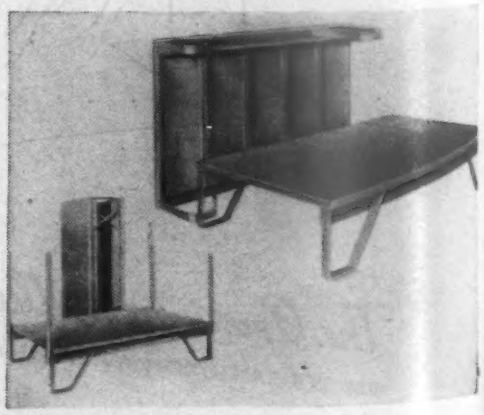
actuated by a foot pedal. Other features of the line include trucks with front shield for facilitating handling heavily loaded boxes without spilling contents, and tilting frame that permits carrying a stack of boxes, or gives extra leverage on heavy lifting. Food Machinery Corp., Riverside, Calif.

OILPROOF APRON

Heavy-duty oilproof industrial apron is made with Ameripol synthetic rubber. Weighs 1½ pounds, and measures 34x47 inches. It is hemmed throughout, and fitted with four grommets. The B. F. Goodrich Co., Akron.

STEEL SKID PLATFORM

All-steel skid platform is available in any required size for use with hand and electric lift trucks. Deck panels made of medium gage high-tensile strength steel



Whatever your needs in power transmission . . .

Regardless of what your requirements in power transmission may be, Foote Bros. has the engineering staff—the skilled production force—the modern plant facilities—to serve you. And above all, nearly a century of experience in producing such equipment.

Today two large plants—one devoted to the manufacture of precision gears, power units and actuators; the other to the manufacture of industrial gears, speed reducers and special machinery—are serving industry. These facilities include research laboratories, a skilled engineering department and a unique heat-treating department providing absolute control so essential to modern gear production.

Whether it's "A-Q" (aircraft quality) Gears of extreme precision that offer light weight, compactness, high efficiency, capable of excessively high speed; or

—Power Units and Actuators engineered to fit your requirements—assuring the accurate mounting so essential to "A-Q" Gears; or

—Speed Reducers in a wide range of sizes and ratios to meet practically every industrial need; or

—Commercial Gears designed to fit your requirements and manufactured in quantities—any size from giants 20 feet in diameter to midgets you can hold in one hand;

—Foote Bros. engineers and Foote Bros. plant facilities are ready to meet your needs.

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 South Western Boulevard • Chicago 9, Illinois

Two engineering bulletins, one on "A-Q" gears, the other on Power Units, offer many suggestions on new developments in application of power. If you have not received copies, mail the coupon below.

FOOTE BROS.

Better Power Transmission Through Better Gears

FOOTE BROS. GEAR
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Dept. I, 4545 S. Western Blvd., Chicago 9, Ill.
Gentlemen: Please send me Bulletins on:
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AUTO BATTERY MAKER SAYS:

"To protect batteries in shipment, we installed an Acme Silverstitcher, and devised a unique hood of corrugated board with a reinforcing closure of Silverstitch Wire. Now dealers praise excellent arrival condition of our product."

USE THE CLOSURE COMBINATION THAT

INSURES SAFER DELIVERY

SilverStitch — *SilverStitchers*

BOX STITCHING WIRE

- Makes stronger, surer closures than other methods . . . unaffected by weather
- One-piece, continuous length, 5 and 10 pound coils . . . cuts loading time
- Galvanized to resist rust
- Always manufactured uniform in width and gauge

BOX STITCHING MACHINES

- Heavy duty construction, low power consumption . . . for long, thrifty service
- Few moving parts . . . vital ones reversible . . . for lower maintenance costs
- Adjustable, single pedal, footrest treadle control
- Operate easily and smoothly

SEALING SHIPPING CONTAINERS BY STITCHING IS FASTER, STRONGER, AND MORE ECONOMICAL

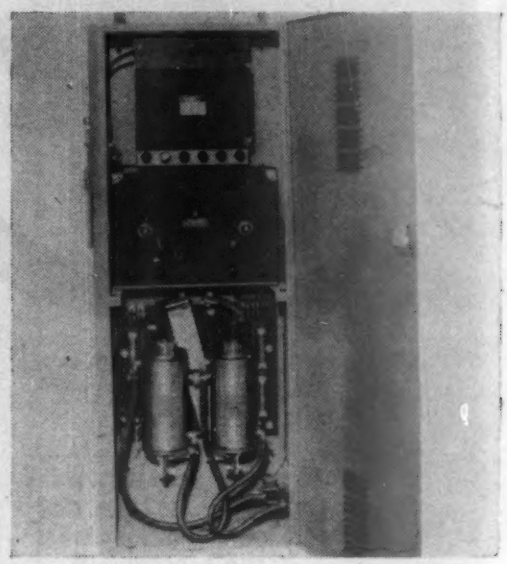
ACME STEEL COMPANY

NEW YORK 7 ATLANTA CHICAGO 8 LOS ANGELES 11

form the load carrying surface, which is a smooth continuous platform for handling sheets of material such as paper, rubber, and leather. Deck panels are welded to each other as well as to the load-carrying "Z" bars. Solid bar steel legs allow empty platforms to be stacked on end. Platforms can be entirely galvanized, or can be made of stainless steel or aluminum. Units are available with integrally welded corner stake sockets. Market Forge Co., Everett, Mass.

WELDING CONTROLS

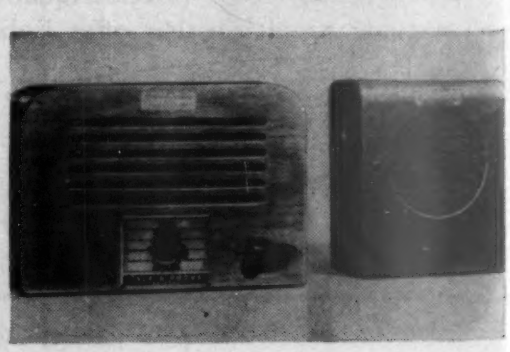
All components as well as the control station are compactly housed in one cabinet in redesigned line of synchronous precision controls for resistance welding machines. The system includes ignition contactors, a weld timer, electronic heat control, and, as optional equipment, sequence controls and tem-



pering control. All the components, except the ignition contactors, are mounted on hinged panels that can be swung out without interrupting service. The timer operates with a.c. circuits only. All rectification circuits have been eliminated. Weld time or heat time is adjustable from 1 to 30 cycles in 1-cycle steps. Control Div., General Electric Co., Schenectady.

INTERCOMMUNICATION SYSTEM

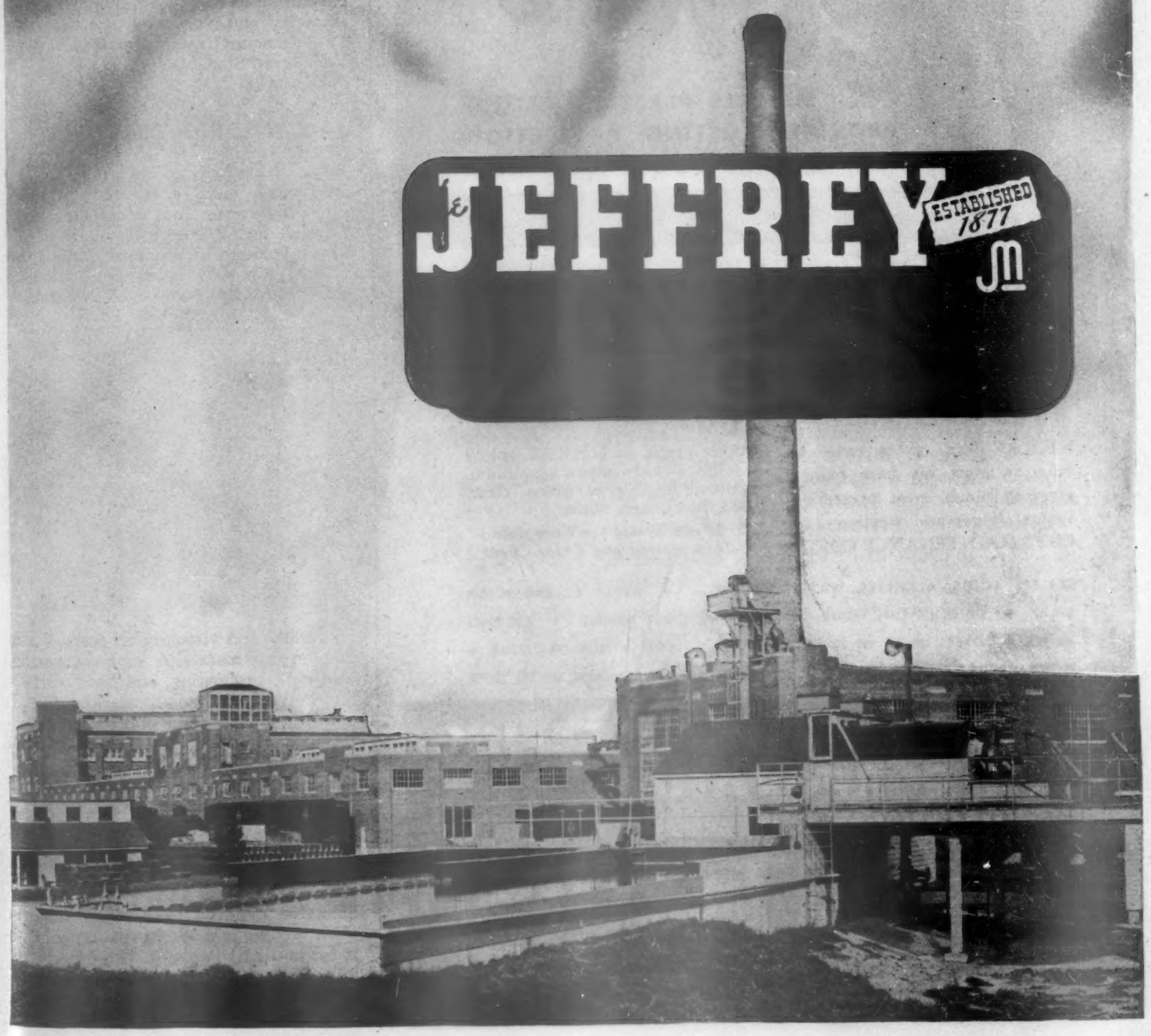
Incorporating Alnico 5 speakers, Insta-Action selector switch, and a powerful high-gain amplifier, intercommunication system consists of one master station working with as many as ten substations. The system may be built pro-



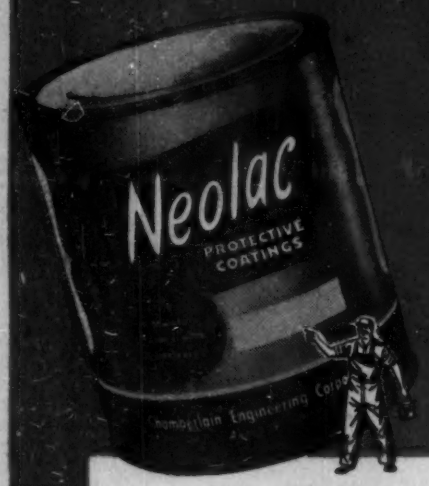
JEFFREY ENGINEERING

...PLANTS

...sharply on the ...food is the ...ina, the entire food ...seeking newer ...and more economical methods of material handling ...re, too, Jeffrey Engineers are constantly developing improved conveying, feeding, drying, cooling and other material handling equipment to provide increased volume, greater efficiency and a better finished product. Investigate.



Keep out corrosion, keep down maintenance costs . . . . .



Neolac

MIRACLE PLASTIC COATING
PROVIDES LASTING PROTECTION
FOR METAL, WOOD, CONCRETE

CORROSION goes hungry in the plant protected by NEOLAC. For this amazing new coating quickly dries to a "live" film of pure plastic so tough corrosion can't eat through. And since NEOLAC is non-oxidizing, it won't deteriorate with age . . . resists chipping and cracking, won't flake off.

SAVES MONEY—

NEOLAC lasts up to twice as long as most oil base paints, gives so much extra protection against fumes and weather . . . CUTS MAINTENANCE COSTS.

ADDS COLOR—

Wide range of NEOLAC colors includes ready-mixed aluminum, yellow, blue, gray, green, clear, red, black and white.

Write Today for Complete Information and Color Chart

RESISTS ACIDS, ALKALIES, WATER, ALCOHOL • APPLY BY BRUSH OR SPRAY • DRIES IN ONE HOUR • NO PRIME COAT NEEDED • 2 COATS AMPLE • COVERS UP TO 450 SQUARE FEET PER GALLON • NON-OXIDIZING • NON-FLAMMABLE • NON-TOXIC • RESISTS AIR TEMPERATURE UP TO 265°F.

CHAMBERLAIN ENGINEERING CORPORATION

5000 BRIMFIELD ROAD, AKRON 9, OHIO

PLEASE SEND ME FREE NEOLAC SAMPLE

Without cost send me test sample of Neolac, prices, and Neolac color chart.

Name_____

Company_____

Address_____

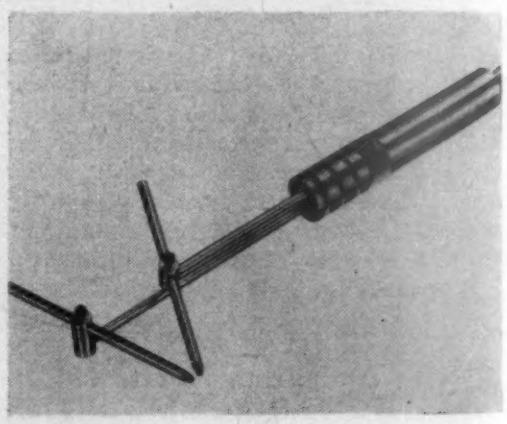
gressively, starting with one set and installing additional substations as needed. Master stations can call any one or all substations at one time and receive an answer. Substations also can originate calls to master, and may be installed in any remote spot up to 2500 feet from master station, whether power supply is available there or not. Master station operates on 110-115 volts a.c. or d.c. Talk-A-Phone Co., 1512 South Pulaski Rd., Chicago 23.

CATHODIC RECTIFIER

Providing protection for steel water tanks and deep well pumps, cathodic rectifier unit is designed to stop rust and corrosion by eliminating the electrolytic action on the metal being protected. The unit is contained in a weatherproofed steel cabinet and has a d.c. output capacity of 2-5 amperes at 31-50 volts, protecting submerged areas up to 10,000 square feet. Preferred a.c. input is 110-3-60, but the unit can be equipped to take other a.c. characteristics. Step controls up to 50 d.a. with moving coil type ammeter and voltmeter are standard. The Trimount Instrument Co., 37 West Van Buren St., Chicago 5.

ARC WELDING TORCH

Permitting electric welders to be used for jobs that formerly required gas units, Lite-ning arc torch is suitable for both a.c. and d.c. welders. The carbon arc flame produced by the torch emits a soft intense heat with no pressure blow or oxides. It makes possible the welding of



aluminum and virtually all ferrous and non-ferrous metals as well as brazing, soldering, preheating, and hard-surfacing. Features automatic arc and thumb control, which permits operator to maintain instant adjustment of the arc at all times. Models are available for ¼- and ⅜-in. carbons. Cesco Products, Inc., 30 North LaSalle St., Chicago 2.

CANTEENS

Selective vending mechanism for in-plant feeding is made in two types. One is for bottled beverages. The other sells milk in paper cartons, sandwiches, fresh fruit, cookies, and candy. It occupies a floor space 35 inches square and is

The Chart that sounded like People Crying!

(BASED ON A TRUE STORY)

by Mr. Friendly

At first glance, it looked like any chart...

But if you looked long enough, you heard voices... A crying sound... and then you began to see that the chart was made of people... of injured workers.

John Roberts, the President of the company, heard these voices one night when the black cold line on the accident frequency chart reached *32.1*.

He called me up and he sounded scared, "Mr. Friendly," he said, "the accident chart... I can't look at it... the figures are flesh and blood, and they're crying for help!"

That was the beginning!...

I called in American Mutual's I. E. LOSS CONTROL* experts and we fought that rising line... we held safety meetings... we helped design special mechanical guards... we helped improve plant layout... we called on all our 59 years of experience in safety work...

In less than a year the figures on that chart went down to *12.4*... and the sound of misery faded away...

Today there is another chart on John Roberts' wall... A chart he loves to look at and listen to... for this chart sings a happy song.

It's a *production* chart and it's going right up...

But that's our business at American Mutual... *chart fixing!*

The biggest extra in business insurance. It's American Mutual's I. E. LOSS CONTROL... It reduces costs... boosts profits... Learn about this efficient service today... Write American Mutual Liability Insurance Co., Dept. F-4, 142 Berkeley St., Boston 16, Mass.

** Accident prevention based on principles of industrial engineering.*

Your helping hand when trouble comes!

A M

AMERICAN MUTUAL...*the first American liability insurance company*

COPR. 1946, AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

★ DON'T YOU BELIEVE IT!

Too long has man been referred to as a commodity. Too long have we gone to the so-called labor market to buy loyal employes. What we actually bought was only the bare output of a man's hands and brain. His loyalty cannot be bought. It can only be inspired—built! And it's up to management to do the building if it wants to enjoy this plus value that wage dollars alone can never buy.

Our new booklet, "Loyalty Is Built—Not Bought", explains how management can utilize the magnetic power of individual recognition to attract the sincere enthusiasm of your workers for their company.

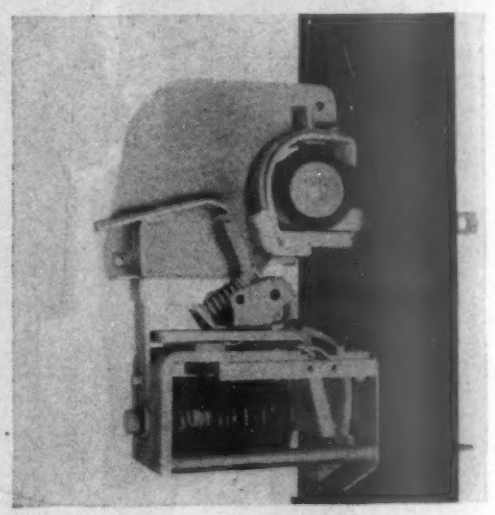
YOUR PERSONAL COPY of this timely booklet will come to you by return mail when you write for it on your company letterhead. Please address Mr. George A. Bond.

GORDON B. MILLER and COMPANY
809 WALNUT STREET, CINCINNATI 2, OHIO

available with automatic coin-changers. It is capable of delivering 20 selected items per minute, with the correct change for nickles, dimes, and quarters made simultaneously. Canteens may be obtained with or without the vended products. United States Vending Corp., Board of Trade Bldg., Chicago 4.

MILL-TYPE CONTACTORS

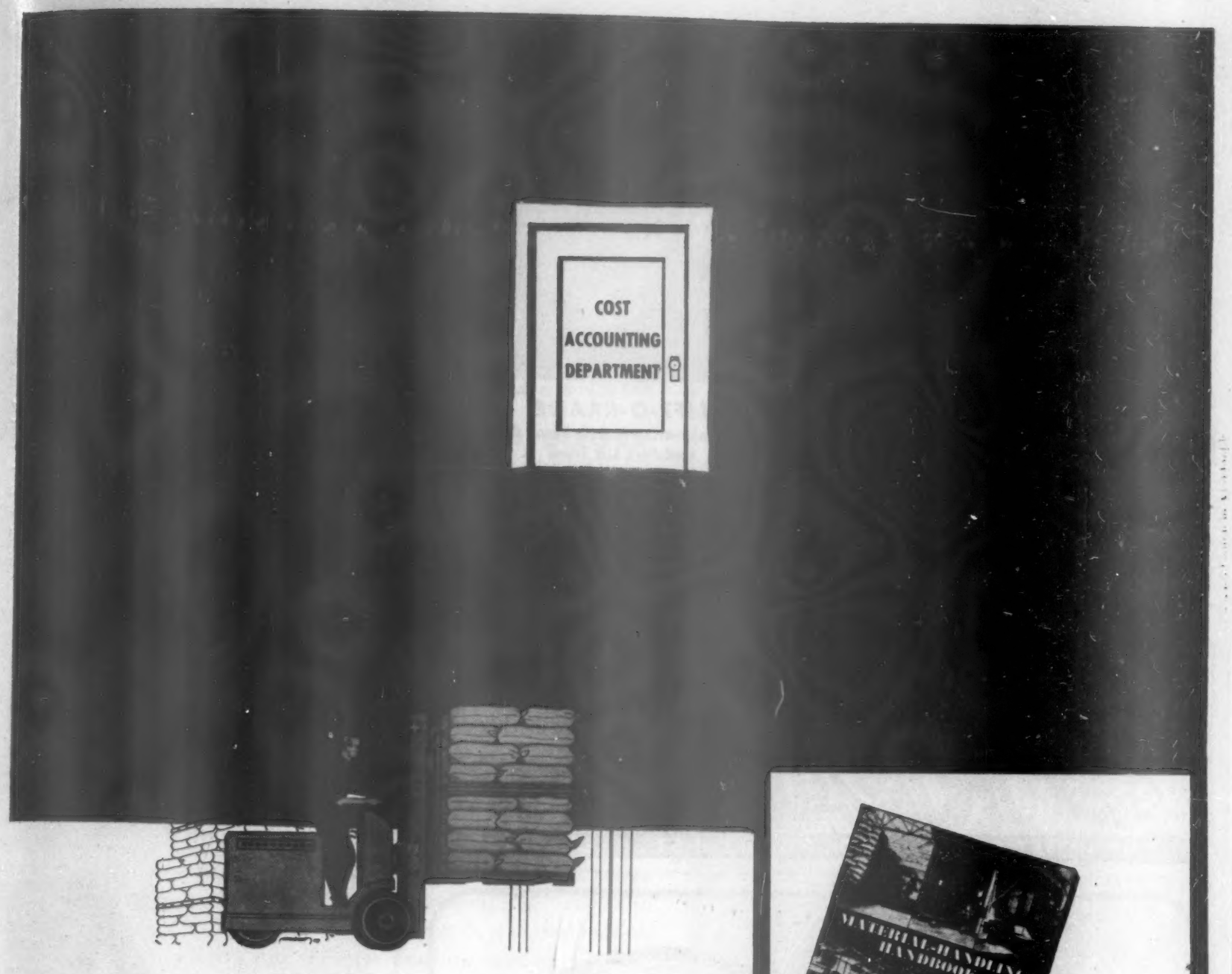
Line of d.c. mill-type contactors for heavy-duty applications consists of nine models of similar construction, ranging in capacity from 100 to 2500 amperes. Two are normally closed types, and the others are normally open. Frames and armatures are made of cold-rolled steel. Copper contactor tips wipe in and close under pressure of a strong steel spring,



and rocker bearing design is used on all the units. The restricted "free" bearing construction prevents abrasive dirt and dust from accumulating between bearing surfaces. The contactors have holes for electrical or mechanical interlocks, and the layer-wound coils are varnish-impregnated. Incoming lines are bolted directly to the copper bar terminals. Control Div., General Electric Co., Schenectady.

FOLDING GOGGLE

The semi-rimless frame of the lightweight Sto-Away safety spectacle is hinged to fold at the bridge. A hollow, stainless steel temple telescopes to one-third normal length, and the goggle folds to the size of a pack of cigarettes. Lenses



Cost accountants agree that material handling, though adding little or nothing to the finished product's value, represents up to 75% of the direct labor payroll.

Small wonder that efficient battery-powered trucks have provided sharp cuts in overall production and warehousing costs—often halving the expense of moving goods through receiving, stockpiling, processing, storing and shipping.

Users with broad experience know that, in material handling, *cost per ton* of goods transported is the final test of savings—and profits. They say invariably, "*Electric* industrial trucks pay off best."

And remember, over 90% of the electric trucks sold in the past twenty years are still in service.

Send for these FREE BOOKLETS:

Two illustrated booklets—MATERIAL HANDLING HANDBOOK and UNIT LOADS—show how to effect important savings in any enterprise where materials are handled. Write us for free copies.

The Electric Industrial Truck Association

208A SOUTH LA SALLE STREET, CHICAGO 4, ILLINOIS

POWER EQUIPMENT CUTS YOUR MATERIALS-HANDLING COSTS

KRANE KAR

Swing Boom Mobile Crane

This rubber tired boom crane lifts, totes, and spots loads up to 10 tons—of any shape or size . . . to any part of the plant or yard. Travels, and swings, tops, raises or lowers the load all at the same time or independently. One man operates it, one engine powers it. *KRANE KAR* pays its own way, doing the work of 6 to 8 men.

LIFT-O-KRANE

The Combination Mobile Boom Crane and Fork Lift Truck

You have at your disposal a machine that is a MOBILE BOOM CRANE when you have crane work —a FORK LIFT TRUCK when you have pallet loads. For crane work, just fold back the forks. For fork jobs, quickly and easily remove the boom. Also obtainable as a FORK TRUCK exclusively — without boom; or as a BOOM CRANE only—without forks.

Power equipment speeds handling of heavy machinery, raw materials, crates, pallet loads, steel, metal scrap (magnet and clamshell bucket available) . . . storing, stacking, tiering inside the plant or in the yard . . . loading and unloading of freight cars, trucks, trailers . . . plant alterations and repairs. Write for Catalog No. 58 on *KRANE KAR* and Bulletin No. 65 on *LIFT-O-KRANE*.

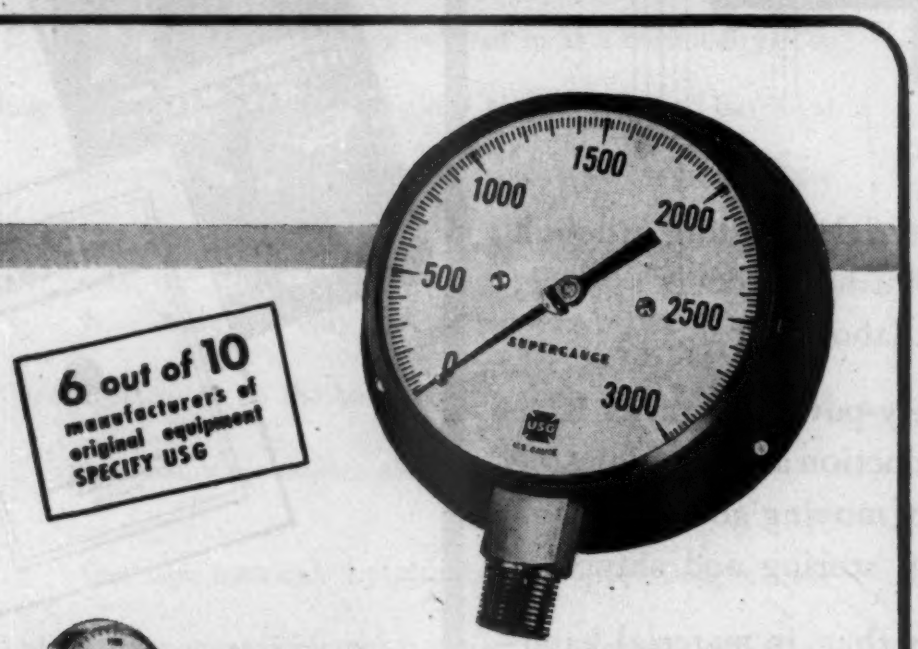
THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

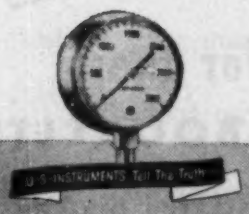
2½, 5, AND 10 TON CAPACITIES

KRANE KAR

TRADE MARK REGISTERED

SILENT HOIST & CRANE CO., 855 63rd ST., BKLYN 20, N.Y.





UNITED STATES GAUGE

Tomorrow's accuracy is here today in the new U. S. Supergauge. Get complete information about this superb instrument now.

DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PENNA.
Manufacturers of Pressure, Temperature, Flow and Electrical Measuring Instruments

USG

are of shatterproof Impax plastic, resistant to high-velocity impact. The clear or green-tinted lenses are interchangeable, and are locked in the deep-channeled Plexene plastic frame. Hinge between temple and frame locks automatically in open position, and temples are available in three different lengths. Watchemoket Optical Co., Inc., Providence 3, R. I.

EMULSIFIER

Marketed under the trade name of Mulsirex, emulsifying agent for use with kerosene and other petroleum cleaning agents is said to remove heavy deposits of oil and light grease from all kinds of metal parts and equipment. Its high flash

point (180 deg. F.) is said to increase the margin of safety for the operator. It can be used in dilutions up to 1 to 10 with solvents. Applied with a spray, brush, or mop, or as a cold tank immersion solution, it is harmless to metals and enameled surfaces. Turco Products, Inc., 6135 South Central Ave., Los Angeles 1.

AIR CONDITIONER

"Packaged" air conditioner, made in 3- and 5-ton-capacity sizes, is suitable for small plants, offices, and cafeterias. The lightweight unit is claimed to feature simple and economical installation, minimum vibration, and efficient operation under varying water temperature and supply. Includes an aluminum semi-

When youire glad you have a Snap-on

Snap-on's Blue-Point Boxockets are stronger . . . safer . . . and require only half the space

Here is safe, powerful leverage that invites confident wrench speed. See how easily it slips into those hard-to-get-at places . . . engaging the nut on all six corners with an encircling "no-slip, no-spread" grip.

Snap-on Boxockets combine *speed* with *safety* on tough nut-turning operations . . . and because of their double broaching, they need only *half the turning space* required by an end wrench when handle movement is limited. Among the many advantages of Boxocket construction are the long, round-shaped handles with a comfortable, full size hand grip that give you powerful leverage; and the placing of the wrench heads at an offset from the handle to give clearance from obstructions.

The complete "double-offset" series contains a full range of sizes from 3/16" up to and including 3 1/8". Available through Snap-on's nationwide, direct-to-user tool service.

Write for the new Snap-on catalog.

I-1

SNAP-ON TOOLS CORPORATION

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Hi-Quality

FLOOR

Treatments

AND

Maintenance PRODUCTS

★ DEPENDABLE
★ UNIFORM
★ ECONOMICAL
★ SAVE TIME

AND PROPERLY PROTECT AND MAKE ATTRACTIVE ALL TYPES OF FLOORS AND GIVE ENTIRE SATISFACTION WITH LESS LABOR.

There is a Hillyard Floor Treatment Specialist in your locality, he will gladly give advice and recommendations on any maintenance problem, call or wire us today, no obligation.

Send for your FREE copy of this new book, full of real information. Write now.

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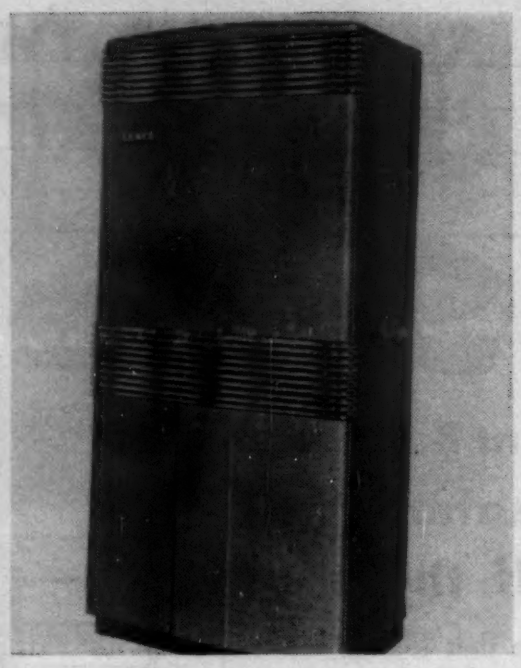
Hillyard Chemical Co. St. Joseph, Mo.
370 TURK ST., SAN FRANCISCO, CALIF.
1947 BROADWAY, NEW YORK, N. Y.



hermetically sealed motor and compressor housing. The compressor is a 2-stage type, and the motor is cooled by the refrigerant gas. Can be connected with ½- or ¾-in. water pipes, and plugged into standard 220-volt, 3-phase, 60-cycle electrical outlet. General Engineering & Mfg. Co., St. Louis.

INSPECTION LIGHT

Portable fluorescent light for maintenance and inspection work can be used in hard-to-get-at places where maximum lighting is required. Light is a standard fluorescent lamp encased in a transparent plastic tube insulated against shorting and shock, and protected against accidental breakage. It plugs into any standard a.c. outlet, and comes equipped with ballast, thermal type starter, and 25-ft. cord. Available in two sizes—6-watt, 1½-in. dia., 11⅜-in length; and 8-watt, 1½-in. dia., 14⅜-in. length. A moisture-proof model for submerging under water may be obtained. Vanol Corp., 4170 Hartford St., St. Louis.

CASTERS

Made in 3-, 4-, 5-, and 6-in. wheel diameter sizes, line of "Thrifty" casters has a complete cast raceway in the top plate and yoke. This feature gives contour contact to the ball bearings in the

HYDRANTS, VALVES

Write for Catalog No. 34

CHECK VALVE GATE VALVE

M & H valves are used in industrial plants for water, gas, steam, oil, chemicals and are furnished in all commercial sizes from 2″ to 30″, inclusive. They are cast iron body, bronze mounted, furnished double disc parallel seat or solid wedge. They are heavily proportioned and have a high factor of safety.

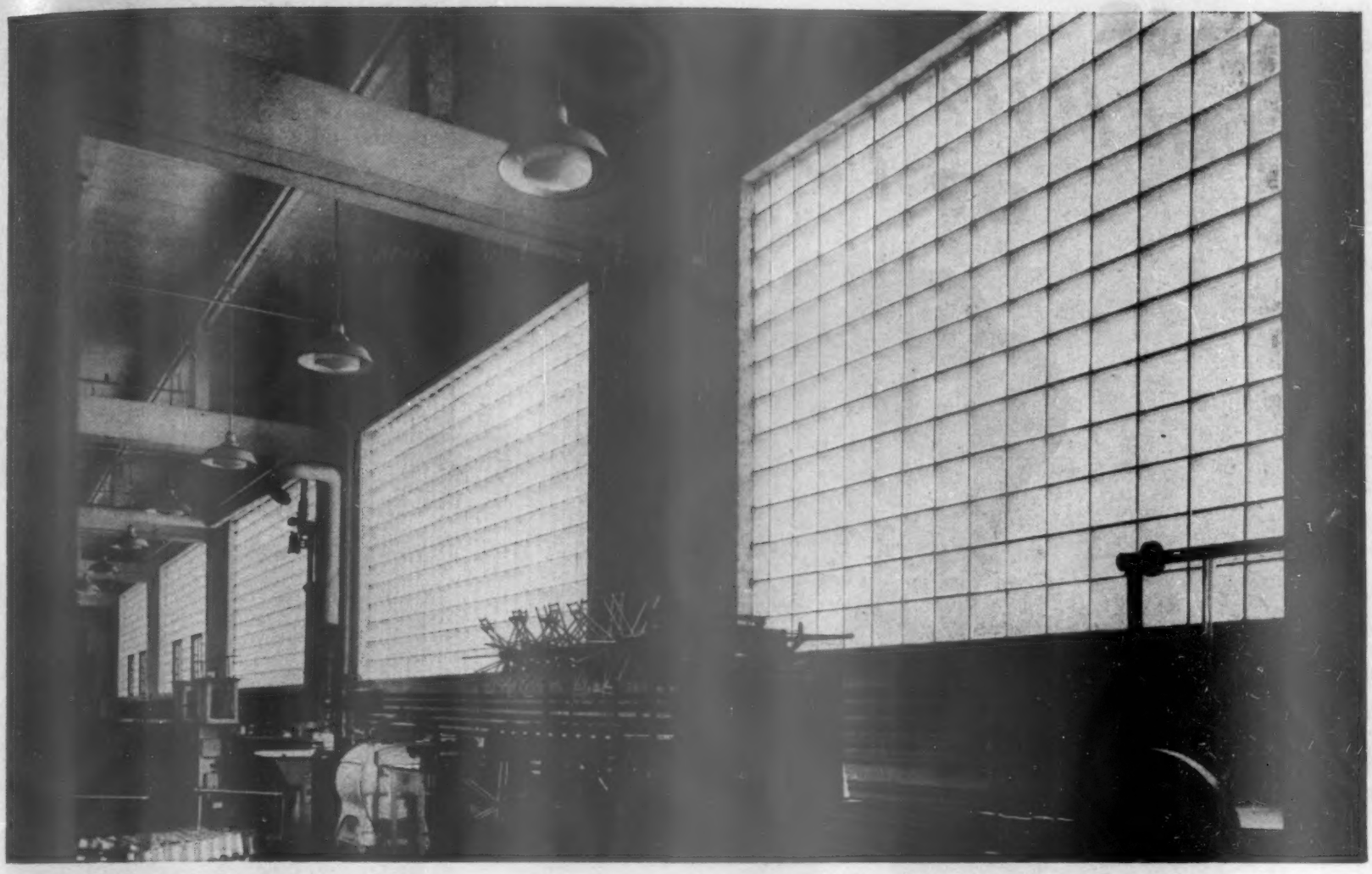
FOR FIRE PROTECTION

M & H Tapping Sleeve and Valve above are used to tap a main under pressure for a branch to automatic sprinklers, hydrants, etc. Cut-in may be made without interrupting water service. WRITE FOR CATALOG 40

OTHER M & H PRODUCTS

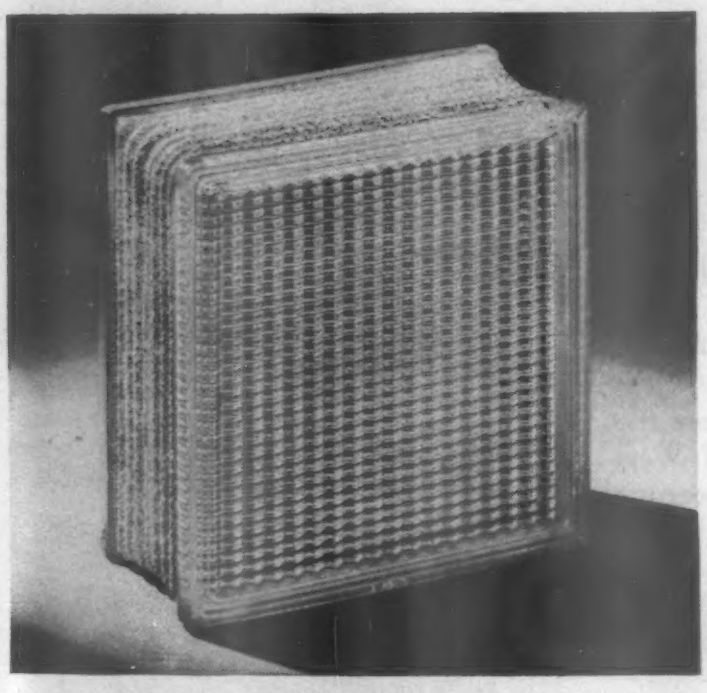
Fire Hydrants
Gate Valves
Tapping Valves
Special Castings
Tapping Sleeves
B & S Fittings
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Sludge Shoes
Flanged Fittings

M & H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA



Chicago throwsters, Oscar Heineman Corp., are engaged in the twisting of raw silk, nylon and rayon into threads in preparation for the hosiery trade. Insulux panels direct daylight to work areas. The high insulating value of the block contributes a substantial reduction in heating costs as compared to single glazing of similar area.

What can you learn from a throwster?



Insulux Glass Block is a functional building material—not merely a decoration. It has solved problems for hundreds of businesses. Investigate.

OWENS-ILLINOIS

INSULUX

GLASS BLOCK

CHANCES ARE that your business is as different from that of a throwster (twisters of raw silk, nylon and rayon into thread) as railroading is from brewing.

But it may well be, that the advantages of Insulux Glass Block are just as outstanding, just as valuable, to your business as they are to the throwster, whose plant is shown. The type of business does not determine the merits of Insulux. Railroads use the block to advantage —and so do breweries.

Insulux panels are permanent and air-tight. Insulux resists the attacks of rust, corrosion and rot.

Maintenance cost is low. Painting is not needed and many users find that Insulux serves them well with no cleaning.

Before you complete plans for modernization or new construction in your business, check the advantages of Insulux Glass Block. A card will bring you details. Address Dept. D-45, Owens-Illinois Glass Company, Insulux Products Division, Toledo 1, Ohio.

EITHER That Microbe GOES OR I Do BOSS!

Strong talk from a worthy working girl to Mr. Head Man!

But then—whether she expresses her sentiments aloud or not—that's just about how strong her attitude is on the subject of cleanliness.

The straight-from-the-shoulder truth is—many an employee feels there isn't room enough in an organization to hold both herself and a neglected, unsanitary washroom.

That home-clean, spic-and-span washrooms inspire permanent loyalty, help prevent the spread of disease, reduce absenteeism and increase efficiency accordingly . . . is no idle washroom chatter. Surveys staunchly back up the facts.

Employees, after all, are as humanly sensitive to their surroundings as the "Boss" himself.

And that's good enough reason why so many alert employers the country over are "heading West" . . . meaning the use of West Washroom Service. Provenly the *West Way* is *one* way of keeping company morale *high* by keeping the "germ count" *low*.

Products That Promote Sanitation

WEST DISINFECTING Company

42-16 WEST STREET
LONG ISLAND CITY 1, N. Y.

★ BRANCHES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

CLEANSING DISINFECTANTS • INSECTICIDES • KOTEX VENDING MACHINES
PAPER TOWELS • AUTOMATIC DEODORIZING APPLIANCES • LIQUID SOAPS

load race and is said to prolong the life of the caster, as well as to facilitate operation. "Endurance" line of drop-forged welded casters is manufactured in wheel sizes of 4, 5, 6, and 8 inches for regular-duty equipment, and in sizes of 5, 6, 8, and 10 inches for heavy-duty equipment. Albion Industries, Inc., Albion, Mich.

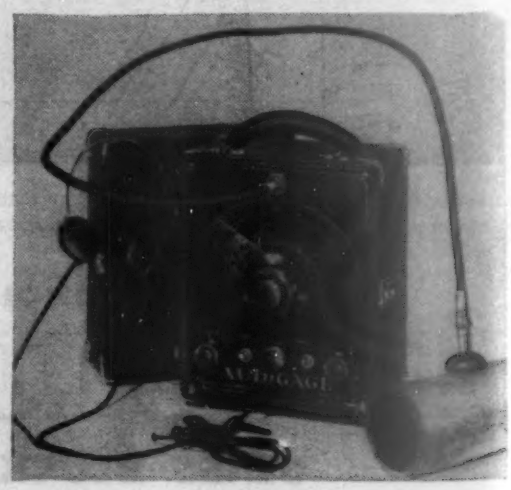
LATHE GUARD

Lathe and wheel guard protects operators from flying particles and oil, without obstructing work or vision at point of operation. It is adaptable to lathes, shapers, grinding wheels, tool grinders, and other machines. Constructed with an all-metal frame, it is equipped with a replaceable tough plastic window,

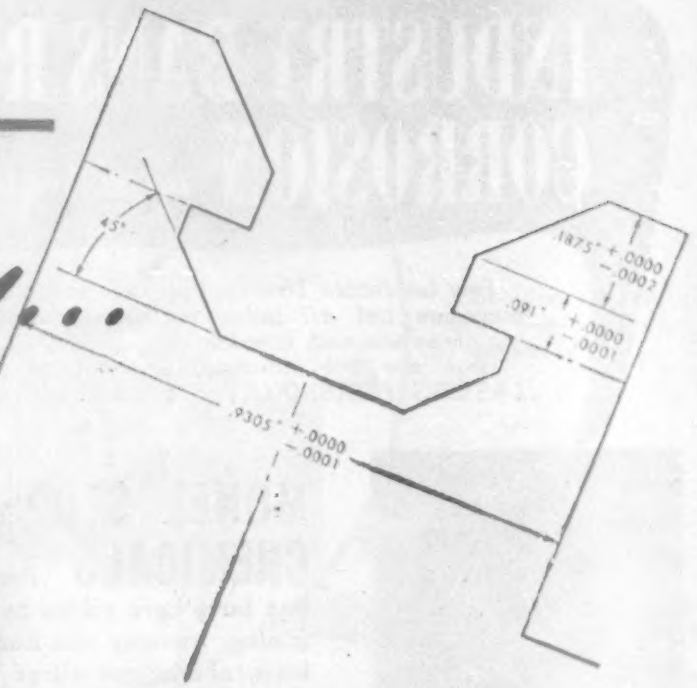
curved to permit over-all work inspection. A universal attachment on its base permits setting the guard at any angle, or moving it laterally when in place on a machine. It moves with the compound, providing constant protection throughout the operation. The Standard Safety Equipment Co., 232 West Ontario St., Chicago 10.

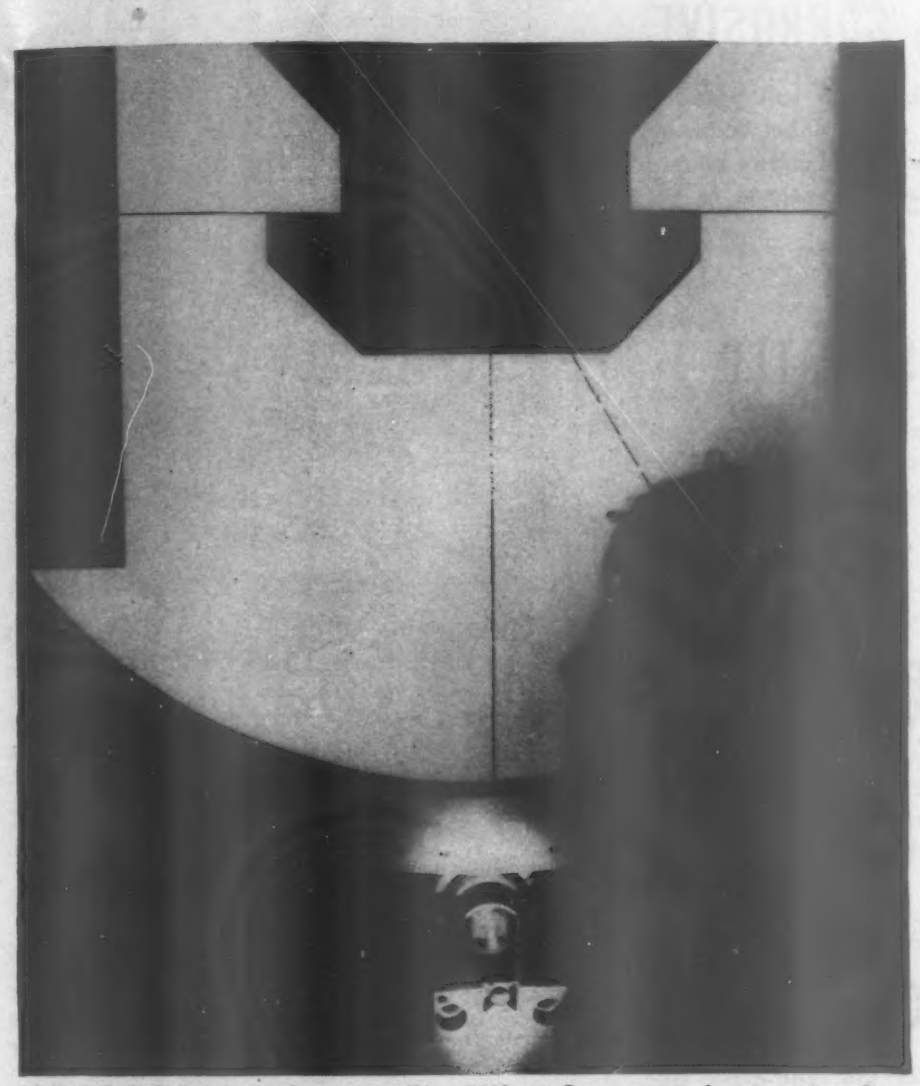
THICKNESS GAGE

Portable, self-contained instrument, known as Audigage Model FMSS-4, is designed to measure the thickness of materials, including steel, from one side only. Can be used to determine thickness of pipes, storage tanks, pressure vessels, and similar objects. Utilizing a crystal-type gage head, powered by a frequency-modulated electronic oscillator,



Assured Accuracy...





PHOTOGRAPH Courtesy The Elliott Company, Jeannette, Pa.

THE dovetail shanks of steam turbine blades and many other turbine components are inspected easily and quickly on Jones & Lamson Optical Comparators. By any other means inspection would be a slow and costly process.

Jones & Lamson Optical Comparators provide a rapid and extremely accurate method for inspecting even the most complex forms.

Our engineers are inspection specialists; their knowledge of holding fixtures, handling methods and suitable Comparator equipment has saved thousands of dollars in manufacturing plants throughout the country.

Call, write or wire for their service today.

Probably a Jones & Lamson Optical Comparator could effect comparable savings for you. Write for our book, "Beyond a Shadow of a Doubt." Or, better still, ask for one of our inspection engineers to call and discuss your inspection problems.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies.

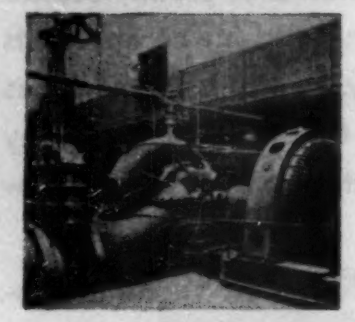
INDUSTRY BANS RUST AND CORROSION *with* Everlasting Fastenings

Few industries can escape the destructive effects of rust and corrosion but *all* industries can reduce their costly ravages in maintenance and breakdown.

Here are five industrial applications where Harper's EVERLASTING FASTENINGS have licked rust and corrosion.

MONEL STOPS CORROSIVE CHEMICALS

Problems in salt production have been solved by using Monel bolts. In mining, treating and handling of many chemicals, non-ferrous alloys are the answer to efficient operation.



BRASS GUARDS WATER SYSTEMS

In valves and pumps that compose the heart of water works, Brass fastenings help in eliminating the most common cause of replacement—rust.

STAINLESS STEEL SOLVES OIL PROBLEMS

Acids and gases at high temperatures attack metal but Stainless Steel alloys cut refinery replacements to a minimum, assure years of continued operation.

UTILITIES CHOOSE SILICON BRONZE

Weather is the bug-a-boo in power lines and other utility applications. Silicon Bronze Bolts reduce season "cracking" and maintenance costs.

NAVAL BRONZE WINS ON SEA

Marine applications demand high strength plus resistance to salt air and water. Naval Bronze fastenings have proved their dependability in marine diesels and ship fittings.

Call upon Harper to solve your fastening problems in your industry.

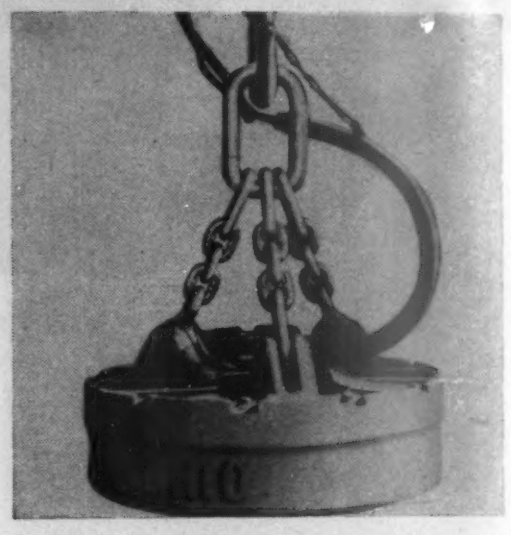
THE H. M. HARPER COMPANY
2651 Fletcher Street, Chicago 18, Ill.
Branch Offices: New York City, Philadelphia, Los Angeles, Milwaukee, Cincinnati, Dallas
Representatives in Principal Cities

HARPER
Everlasting Fastenings
Chicago

it emits audible signals corresponding to harmonic resonance. The frequency difference between any two adjacent audible signals as read on the tuning dial is converted into wall thickness on a concentric thickness scale. Branson Instruments, Inc., Joe's Hill Rd., Danbury, Conn.

MAGNET CHAIN

Triple magnet chain incorporates a 60-deg. twist in two of the three connecting links, which serves to keep the links of the legs perpendicular to each other. Wear caused from gouging and kinking is therefore said to be reduced to a



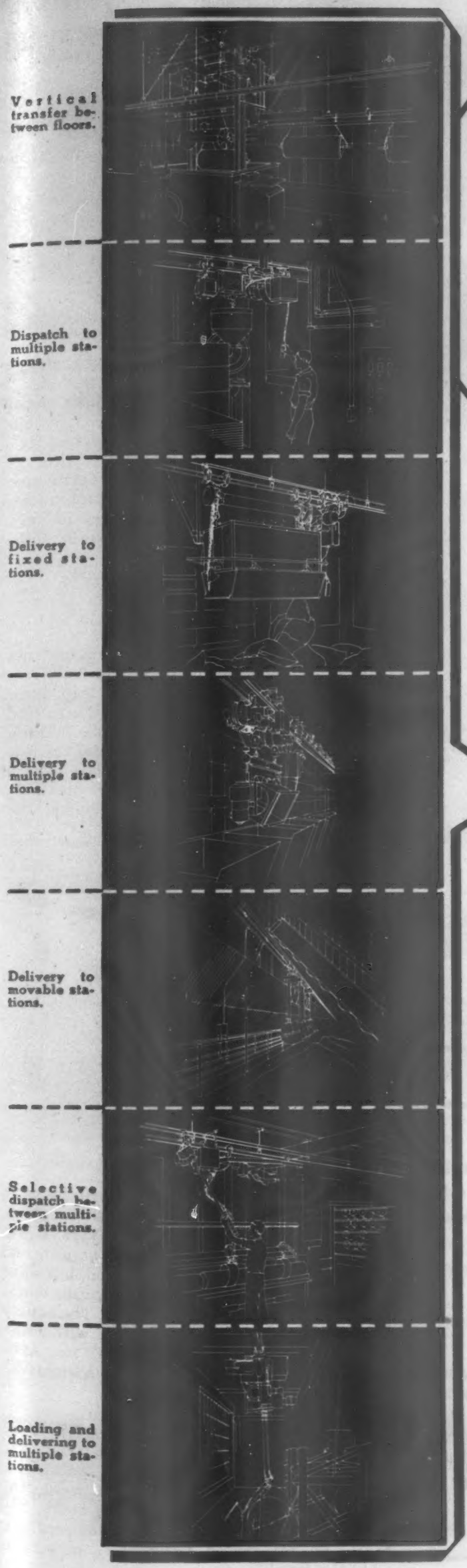
minimum. The alloy steel used has 100 per cent more tensile strength than low-carbon steel or wrought iron, according to the manufacturer, and its resistance to shock, grain growth, and work hardness eliminates the need of periodic heat-treatment. S. G. Taylor Chain Co., Hammond, Ind.

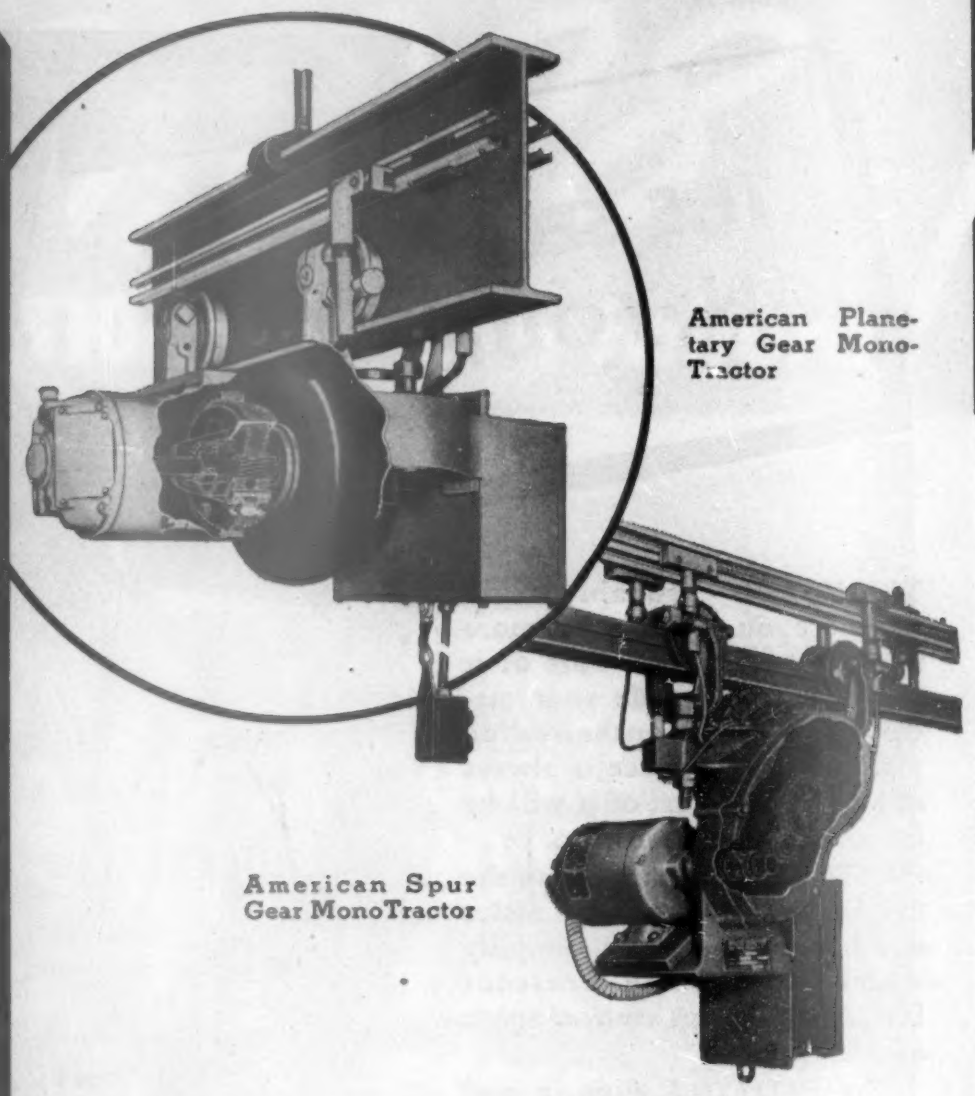
FIRE BLANKET

Useful as an emergency wrap if a person's clothing is aflame, fire blanket can be used as an auxiliary fire extinguisher to smother flames from vents, small containers, or tanks. Can be utilized as a fire shield, welding screen, or as a salvage blanket to protect materials from water, chemicals, and heat. Fabricated of high tensile strength glass cloth, impregnated on both sides with synthetic rubber, it is 60x80 inches. Hems and seams are vulcanized and folds are heat creased. Blanket has large brass grommets at top and a weather resistant bracket to enable it to be hung up outdoors or inside. It is red in color, and marked with the words "fire blanket." United States Rubber Co., Rockefeller Center, New York.

HYDRAULIC DRIVE

Known as Electrofluid Drive, "packaged" power unit is made in horsepowers up to 20. The drive is a compact, motorized hydraulic combination consisting of a general-purpose a.c. induction motor flange-mounted on a housing containing


Vertical transfer between floors.
Dispatch to multiple stations.
Delivery to fixed stations.
Delivery to multiple stations.
Delivery to movable stations.
Selective dispatch between multiple stations.
Loading and delivering to multiple stations.



Automatic Carriers

For Overhead Handling

Through the application of simple electrical and mechanical devices, American Mono-Tractor Units perform automatic operations with extreme accuracy and reliability, saving costly handling labor and supervisory attention.

While unique in many features, such systems are built mainly from standard units. Mono-Tractors can be applied to carriers operating on any smooth bottom track. An American MonoRail Engineer is available for consultation in every important industrial area.

SEND FOR BULLETIN C-1

A 56-page book showing successful applications of American MonoRail Systems.

THE AMERICAN MONORAIL COMPANY

13114 ATHENS AVENUE • CLEVELAND 7, OHIO

THE SECRET ROOM IN YOUR PLANT

IT'S THERE — probably right where you need it most—more room for materials. Part of it may be right beside your machines. Part of it is on the loading platform where space is always at a premium. Part of it will be in your warehouse.

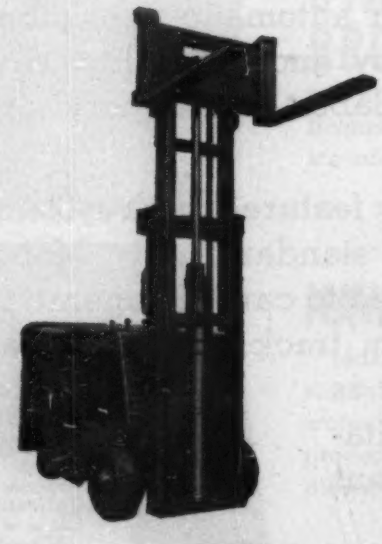
USE IT—that space above the five-foot-level! Clear your aisles and loading platforms. Simplify warehousing. The Crescent PALLETIER makes *vertical* space *usable* space.

The PALLETIER slips in and out of congested aisles and areas, negotiates steep ramps, steps up loading and unloading of common carriers, ends demurrage.

Send for the PALLETIER bulletin now.

CRESCENT TRUCK COMPANY
1100 Willow St. • Lebanon, Pa.

Member Electrical Industrial Truck Association



ELECTRIC
Crescent
PALLETIER

PALLETIER HIGHLIGHTS

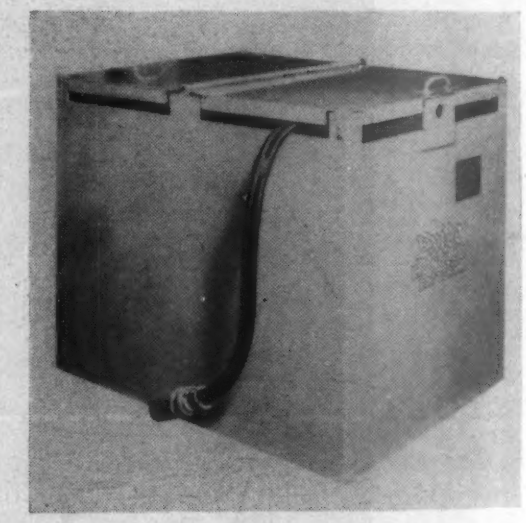
- Operator spots and tiers without stirring from seat.
- All control levers at driver's fingertips.
- Full magnetic control protects against forced acceleration.
- Inspections and adjustments simplified by easy accessibility to all mechanisms.
- Minimum maintenance costs.

This is the truck to take loads off your mind.

a hydraulic coupling. Output shaft may be direct-connected to the driven machine or to a speed reducer unit. It may also be connected to driven machine through chain, gear, or belt drives. If the driven machine becomes stalled, the thermal overload protective device functions in a few seconds. Fluid traction coupling absorbs the energy of motor rotor. Link-Belt Co., 307 North Michigan Ave., Chicago 1

TRUCK BATTERY

Adaptable for powering any large truck, Exide-Ironclad battery, which weighs 5 tons, has a capacity of 1500 amp.-hours. Designated MEH-31, it is said to give full 8-hour service on a 30,000-lb. industrial ram truck, without recharge. The battery is equipped with positive plate in which the active material is practically sealed in tubes of slotted rubber. The

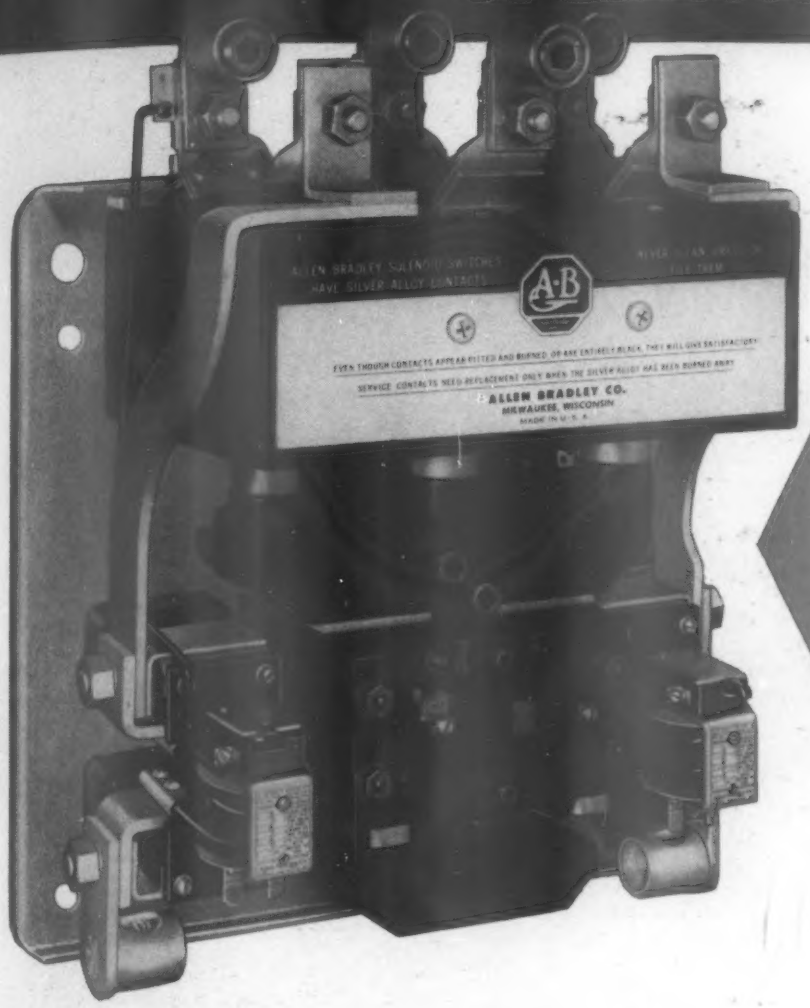


negative plates are made extra heavy to match the lift of the positive plates. Separators are made of Exide Mipor, which is said to possess the porosity and other characteristics of wood, but to be unaffected by heat, electrolyte, or vibration. Each cell has 31 plates. The battery is assembled in a steel tray with cover. The Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia 32.

FLEXIBLE METALLIC PACKING

Resilient flexible metallic packing is suitable for steam and air rods, centrifugal pump shafts, valve stems, and expansion joints where the temperatures do not exceed 450 deg. F., or surface

ON TEST. 5,721,098 OPERATIONS before failure!



NEW SIZE 5 Bulletin 709 SOLENOID STARTER Shows Amazing Ruggedness in Life Tests

Now . . . Solenoid Construction . . . with all its Advantages . . . in a 300-Ampere Starter

In actual mechanical life test, the new Allen-Bradley Size 5 solenoid starter operated 5,721,098 times before a minor failure occurred. This amazing test proves the inherent ruggedness and long life of this new solenoid starter—a life span heretofore unheard of in a 300-ampere starter!

The New Size 5 solenoid starter has all the proved advantages of Allen-Bradley solenoid design—simple construction . . . maintenance-free, double break, silver alloy contacts . . . compact, self-contained switch mechanism. This starter will bring you the same astounding results in a 300-ampere switch as you have been enjoying in Allen-Bradley solenoid starters of smaller capacity. Therefore, for your large motors, specify this new solenoid starter.

Bulletin 709, Size 5 solenoid starter in its attractive, NEMA Type 1, sheet metal enclosure with white interior.

A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

NEW SIZE 5 Bulletin 709 SOLENOID STARTER takes...

40% LESS SPACE

50% LESS WEIGHT

Put a conventional clapper type starter up against the New Size 5 solenoid starter. Notice the difference! The New Size 5 is much smaller and lighter. Yet it provides much more space for wiring, and will outperform the clapper starter. It is more rugged and reliable . . . has a greater current interrupting capacity . . . is easier to install . . . is practically maintenance-free. Each pole of the New Size 5 solenoid starter is enclosed in an individual arc chamber which confines the arc and prevents flashover. This new unit will easily interrupt ten times its maximum horsepower rating. Following are a few of its other advantages:

UNIT CONSTRUCTION

All parts are assembled on a steel base plate and insulated from it. The starter can be mounted as a unit directly on any metal surface without extra insulation. All terminals are readily accessible from the front.

NO CONTACT MAINTENANCE

Patented double break, silver alloy contacts are used. Oxides that may form on these contacts are good electrical conductors. Hence, they never require filing or dressing, and valuable contact life is not wasted.

ONLY ONE MOVING PART

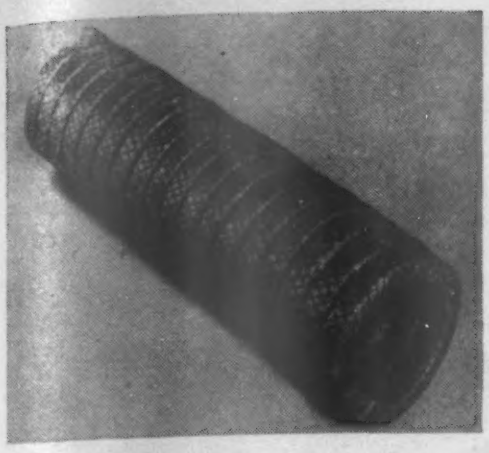
The only moving part in this starter is the solenoid plunger which moves up and down in a phosphor bronze guide, practically without friction. There are no pins, pivots, or hinges to corrode or gum up. No flexible jumpers to cause trouble or delay switch action.

Allen-Bradley Company
1316 S. Second St., Milwaukee 4, Wisconsin

LARGER SPACE FOR WIRING, TOO

A-B Quality

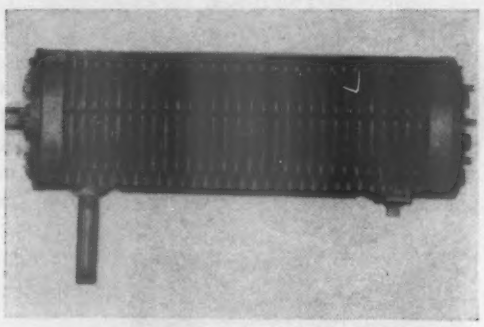
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL



speed is not greater than 600 f.p.m. It incorporates a cross-sectional composition of non-frictional metallic foil combined with asbestos yarns. High-temperature-resistant lubricants and flake graphite are said to seal, and reduce frictional wear. Raybestos-Manhattan, Inc., Manheim, Pa.

HEATING UNIT

In a single small and compact unit, the Aridizer offers the principle of heat transfer for heating air and gases, as well as for superheating steam. According to the manufacturer, temperatures up to 1000 deg. F. can be maintained with control of leaving temperatures held to within plus or minus 1 deg. F. The heat-



ing of compressed air for drying and dehydrating is made possible by the bilateral fin design of the unit, and the process permits close control of moisture content of the product. Use of heater is said to produce a finished product not discolored from burning. Heating may be effected by electric calrods, oil-, or gas-burning equipment. Goodyer Industries, Inc., 224 South Michigan Ave., Chicago 4.

CHANGE IN PRODUCT NAME

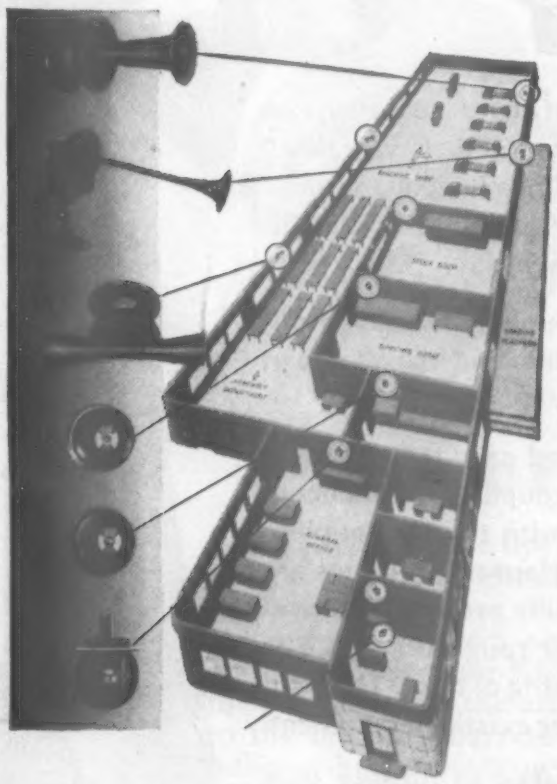
Fischer & Porter Co., Hatboro, Pa., manufacturer of variable area type flow metering instruments previously called Rotameters, announces change in trade name to Flowrators.

ALUMINUM HAND TRUCK

Built of one-piece permanent mold aluminum alloy cast, "Universal" hand truck has a load capacity of 2400 pounds. Furnished standard with 12x3-in. aluminum rubber-tired wheels having

FARADAY KODEMASTER

Gets the right man in a jiffy!



A long distance call—an important conference—can't wait for the operator to telephone all around the plant. Time is valuable—too expensive to waste! Kodemaster will get the right man in a jiffy—only a few seconds and its message reaches every nook and corner of the plant and the man is located.

Every factory large enough for a telephone switchboard needs the efficient Faraday Kodemaster. It's the ideal system for locating individuals in a hurry—up to 30 different code signals.

Kodemaster is a unique, compact, fool-proof control for *old* or *new* signal systems. May be set up with any number or combination of bells, buzzers, horns, Kodaires, chimes, sirens.

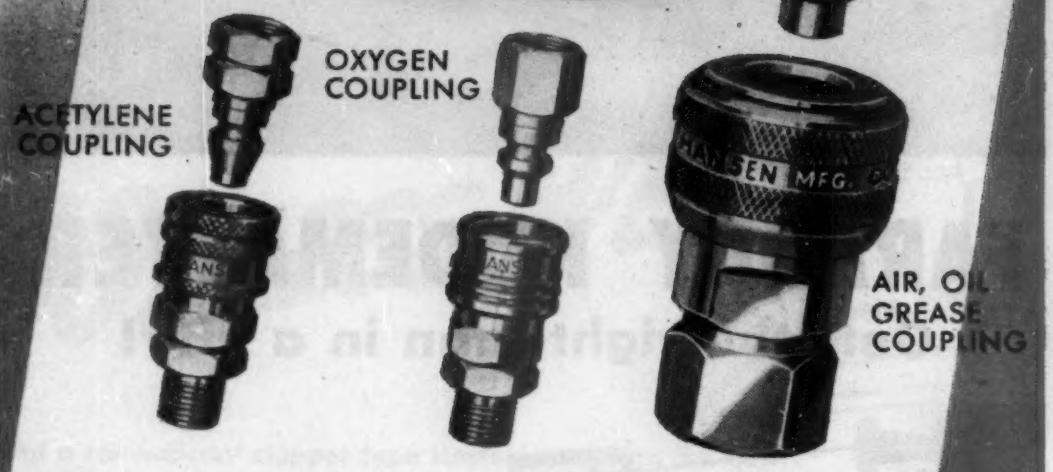
For time-saving signaling, and low installation and maintenance cost, install Faraday Kodemaster. Can be installed by any competent electrician.

FARADAY UNIPACT units are interchangeable, "as easy as plugging in a toaster."

At your electrical distributor's

FARADAY
ELECTRIC CORPORATION
Adrian, Michigan

HANSEN *Couplings*
Are Used On a VARIETY of JOBS



EACH DAY a new use is found for Hansen Couplings, proving their adaptability, versatility and right design. Hansen couplings have made their mark in many fields and their long list of accomplishments is growing longer each day.

There is a specific Hansen coupling made for air, oil, grease, oxygen, and acetylene, and they come in a wide range of standard sizes.

Hansen couplings are simple and easy to operate... merely push plug into socket, coupling is connected and locked...slide sleeve back with thumb, coupling is unlocked and disconnected. Hansen couplings are rugged, with all moving parts fully protected, consequently they will stand up under rough usage. Complete swivel action prevents kinking of hose. They can be readily incorporated in new or existing equipment.

Our representatives will be glad to discuss with your engineers the possibilities and many advantages of Hansen couplings. Send for illustrated catalog.

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New England States:
A. D. GEIGER, Belmont, Mass.
Eastern, Southern States:
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Northern Ohio:
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STEINHAGEN AIRLINE PRODUCTS, Dayton, O.
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NORRIS ENGRG. CO., Chicago, Ill.
Indiana, Wisconsin:
NEFF ENGRG. CO., Ft. Wayne, Ind.
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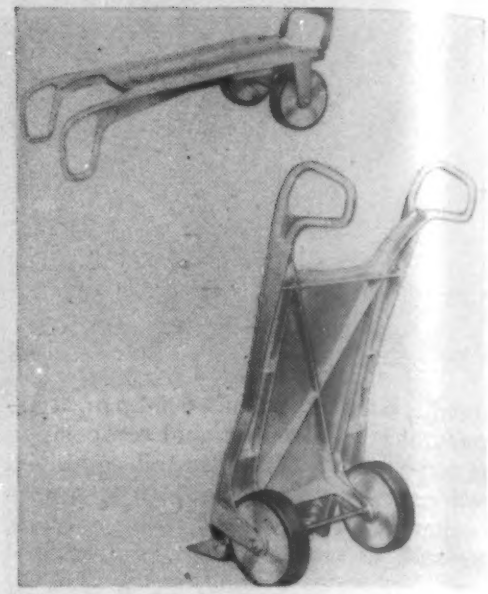
THE HANSEN MANUFACTURING CO.
1786 EAST 27th STREET • CLEVELAND 14, OHIO



sealed-in-grease Timken tapered roller bearings. Concave over-all bed of 1-in. aluminum cast in unit over a sturdy X channel aluminum frame eliminates need for cross-members or bolts, and there is no tendency for the truck to weave under heavy loads, maker says. Weighs 100 pounds. "Handsaver" grip that protects the operator's hands also acts as legs, and leave the full 60-in. bed free for load carrying. Aerol Co., 1823 East Washington Blvd., Los Angeles 21.

PUMP

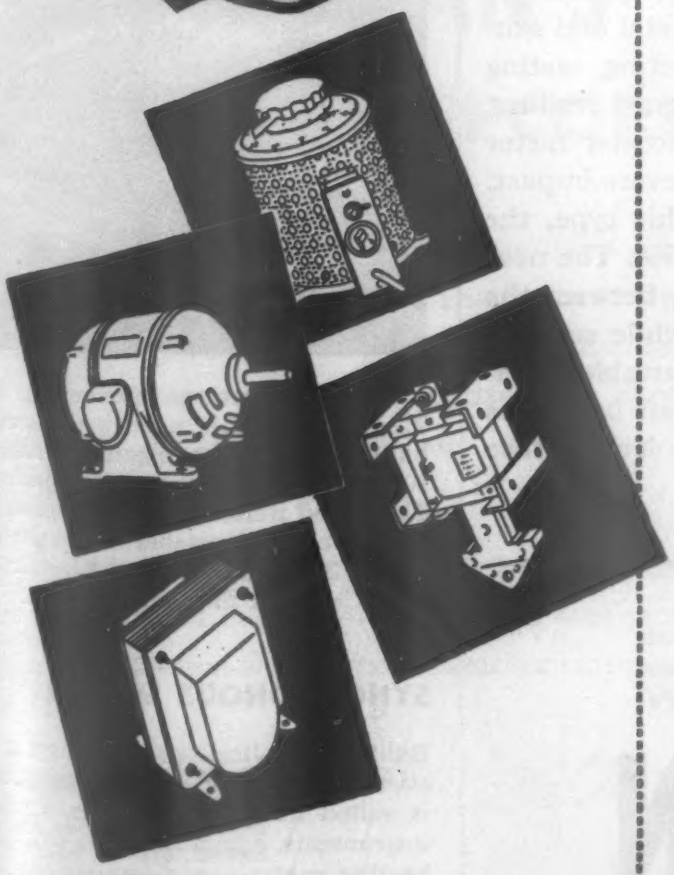
Ball-bearing motor-driven pump, called Model 2-C Rumac, handles 70 g.p.m. of liquid at a total head of 22 feet. Equipped with ¾-hp., 1725-r.p.m. motor, it can be installed either below or above the

reservoir, in a horizontal or vertical position. When desired, it can be converted to pipe inlet type by use of a pipe adapter plate available in several sizes. Other models range from ¼ to 2 horsepower. The Ruthman Machinery Co., Cincinnati 2.

STAINLESS STEEL FITTINGS

Flanged-type conical end fitting, for use with light-gage stainless steel tubing, is fabricated from type 316 stainless steel. A complete line of ells, tees, crosses, return bends, Y's, laterals, ferrules, reducers, and adapters is manu-

The KEY to sure Overheat and Burnout Protection



Protectors

A Klixon Protector opens the door to safe, sure protection against overheating and burning out of such equipment as motors, solenoids, transformers, variable voltage transformers and similar types of electrical apparatus. Because Klixon Protectors are built into the equipment by the manufacturer, they are matched to the thermal characteristics thereby assuring safe full over-heat protection without preventing maximum output. Thus, when temperature within a Klixon protected unit reaches a dangerous level, "snap," Klixon opens the circuit. When it cools to safety, the protector recloses the circuit either automatically or waits for manual reset, depending on the type of protector selected. Harmless momentary overloads do not cause nuisance tripouts.

Ask manufacturers of motors, transformers, solenoids and variable voltage transformers to include Klixon Protectors on the equipment you buy.

KLIXON

TRADE MARK REG. U. S. PAT. OFF.

SPENCER THERMOSTAT COMPANY

2101 FOREST STREET, ATTLEBORO, MASSACHUSETTS

PROTECT EYES WITH
WILLSON CUP GOGGLES

Two way ventilation inside lens through side screen and slotted ring keeps fogging to minimum.

The tougher the job, the more your men will appreciate the dependable protection of WILLSON RR50 cup goggles.

Heat treated Super-Tough* lenses in durable plastic eye cups, provide both front and side protection against steel chips, splashes of molten metal and similar hazards encountered in chipping, riveting, casting and such occupations. A specially designed resilient spacer ring under the lens provides a greater factor of safety when the lens is subjected to severe impact.

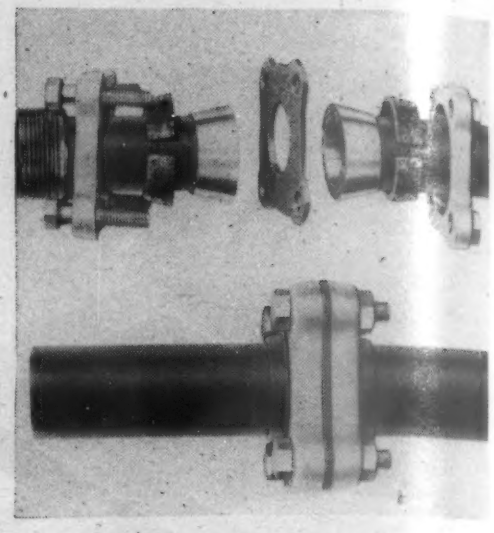
For utmost comfort in a goggle of this type, the eye cups are molded to fit the eye cavities. The nose bridge can be adjusted for correct spacing between the eye cups and does not ride the nose, while snug fit without pressure is assured by an adjustable headband. Dual ventilation gives through draft by means of a perforated sideshield, and over the lens surface through a slotted retaining ring.

*T.M. Reg. U. S. Pat. Off.

For help on eye protection problems get in touch with your Willson distributor or write direct to Willson Products, Inc., 219 Washington St., Reading, Pa.

WILLSON 75 YEARS

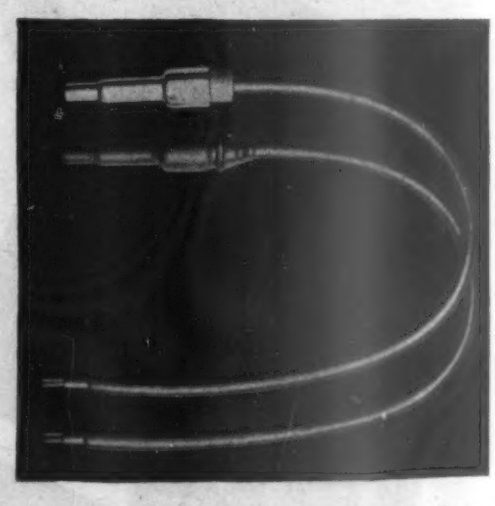
DOUBLE WILLSON
PRODUCTS INCORPORATED
READING, PA., U.S.A. Established 1870



factured for use with commercial tolerance tubing having outside diameters of 1, 1½, 2, 2½, 3, and 4 inches. Can be adapted to other fitting and valve types. The flanged coupling, available in aluminum or stainless steel, is built to withstand working pressures up to 250 p.s.i. Simple gaskets used between conical fitting ends and the flange maintain a tight joint under pressure or vacuum. Tri-Clover Machine Co., Kenosha, Wis.

THERMOSTAT

Immersion-type thermostat, designated Type MI, is made for close temperature control on quick battery chargers. Can be used also for controlling the temperature of strong liquids, gases, and hot plates. It is supplied with a neoprene sleeve, which gives protection to the

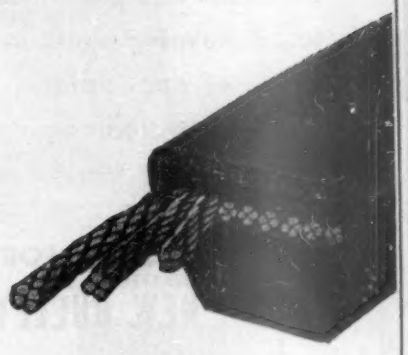


unit for applications injurious to brass. The thermostat is a rugged precision-built unit with an electrical rating of 1000 watts, 110 volts a.c., non-inductive. The on-off differential is 3 degrees, and the control is adjustable within the range of 0 to 250 deg. F. United Electric Controls Co., 71 A St., South Boston.

SYNCHRONOUS MOTOR

Built for applications requiring a constant speed at a given frequency, motor is suited for timing devices, recording instruments, communication equipment, heating controls, and similar uses. The Model SX motor, 2⅜x2⅛x1½ inches in size, has a torque of 30-inch-ounces at 1 r.p.m. Power input uses 2.7 watts at 115

MANHATTAN'S *Condor* WHIPCORD V-BELTS



In a team of Condor Whipcord V-Belts there are no laggards to kill the load pullers. The inelastic stretch left in a Condor V-Belt after manufacture is negligible. The stout Whipcords that comprise the Strength Members of a Condor V-Belt are "laid to stay" in their firm matrix of Flexlastics.

Flexing can be at high speeds and continuous on short centers without deterioration due to overheating. As the cross section shows, the Flexlastics surrounding the Whipcords afford an effective cushion against friction and are specially compounded to dissipate internal heat. Note the unusual flexibility of the Whipcord construction in the demonstration above.

This means better contact in the sheave grooves . . . steadier pulling with multiple belts of uniform quality.

Whether your drive is two belts or twenty, make sure you get all "pull" for your power costs by using CONDORS.

8 ACKNOWLEDGED ADVANTAGES

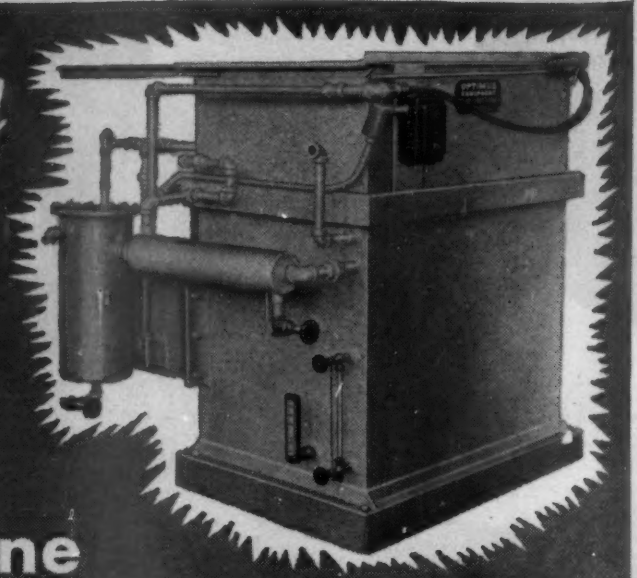
1. Wide margin of strength
2. Minimum inelastic stretch
3. Uniform flexibility
4. Maximum resistance to structural breakdown
5. Smooth running
6. Maximum traction
7. High resistance to side wear
8. Correct lateral reinforcement

The term FLEXLASTICS is an exclusive MANHATTAN trade mark. Only MANHATTAN can make FLEXLASTICS.

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION
EXECUTIVE OFFICES AND FACTORIES PASSAIC, NEW JERSEY

Announcing

a new complete line of Metal Parts DEGREASERS



Type OP-1-40 OPTIMUS Vapor-Spray Type Degreaser. Designed for use with trichlorethylene. Installed to degrease metal parts prior to plating. All parts of unit hot galvanized after fabrication. Heating and cooling coils readily removed. Unit acts as a still to recover salvaged solvent. One of a series of standard OPTIMUS models.

To adequately round out and complete its line of Metal Cleaning and Drying Equipment, the Optimus Equipment Company announces the manufacture and marketing of a full line of Metal Parts Degreasers.

This new equipment, which has been carefully engineered to include the latest developments in the field of vapor degreasing, will cover a wide range of applications. Equipment will be available embodying a varied number of cleaning cycles, including Vapor, Vapor-Spray, Liquid-Liquid-Vapor, Liquid-Vapor, as well as combinations of these and the use of supplementary pump and spray washing facilities, to meet special requirements.

Investigate the production savings which vapor degreasing may make possible in your metal finishing operations. Let OPTIMUS engineers submit an equipment plan specially designed to fit your needs, embodying the use of standard or special models.

SEND FOR

NEW BULLETIN

Write today on your business letterhead for your copy of new illustrated bulletin No. 6E1, describing OPTIMUS Equipment and Dependable OPTIMUS Detergents for modern metal parts cleaning operations.

SOLVENTS FOR VAPOR DEGREASERS—The solvents, Trichlorethylene and Perchlorethylene are available to OPTIMUS Equipment users and others in the metal finishing field, supplied from our several conveniently located warehouses.

OPTIMUS EQUIPMENT COMPANY

ENGINEERS AND MANUFACTURERS

139 CHURCH STREET, MATAWAN, N. J.

STANDARD AND SPECIAL TYPES OF EQUIPMENT FROM THE SMALLEST TO THE LARGEST SIZES FOR A WIDE VARIETY OF OPERATIONS.

OPTIMUS EQUIPMENT

FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

or 230 volts, 60 cycles, and average heat rise is 30 deg. C. Rotor speed is 240 r.p.m. at 60 cycles, and 28 standard gear trains range in speeds from 60 r.p.m. to 1 revolution in 24 hours. The R. W. Cramer Co., Centerbrook, Conn.

SMOKE INDICATOR

Photo-electric smoke indicator, Type A2OC, shows the density of smoke passing through the flue or breaching of a heating or power plant, and signals when density is excessive. Unit consists of a photo-electric control and light source mounted on opposite sides of the flue. A

sensitivity adjustment permits the equipment to be set to signal when required. Supplementary equipment available includes bell alarms, densometers to give continuous indications of smoke density, and recorders to show the time of day at which excessive smoke passes through the stack. Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

SYNCHRONOUS PROGRAM CLOCKS

Automatically controlling signals such as bells, horns, lights, sirens, and gongs on any pre-determined schedule, synchronous program clock has standard 12-hour full vision dial, and program disks that rotate in either 12 or 24 hours. The signal switching system carries 1000-watt load. Mechanism can be set to close an electrical circuit at any desired 2½-min. interval in the 12-hour disk, or 5-min. interval in the 24-hour disk. A toggle switch is included to cut

Kodak

The Kodak Transfax Process

● so simple to use... ● in so many ways...

Transfax is a white spray, light-sensitive, quick-drying . . . It reproduces designs, legends . . . quickly and accurately . . . on metal, plastic, and many other surfaces.

It's as simple as this...

You spray it on the product-surface. Some surfaces need special primers.

You place a transparent or translucent original on the Transfax-coated surface. You expose to strong light.

You rinse with a weak ammonia solution.

You get a Transfax reproduction of the original quickly . . . inexpensively . . . without a darkroom . . . and the process can be handled by anyone with ordinary skill.

Where a long-life or a wear-resistant finish is desirable, a clear lacquer overcoat should be applied.

You can use it like this...

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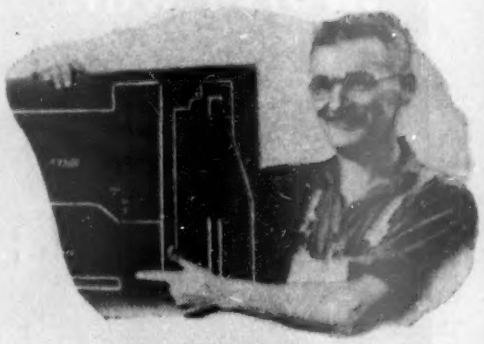
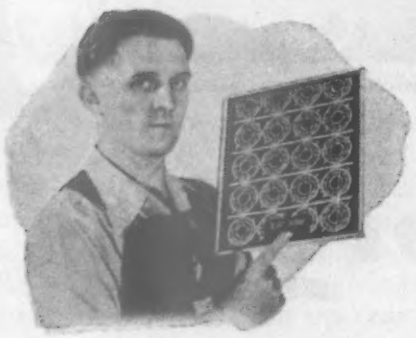


. . . for fabricating directions



. . . for name plates or monograms

. . . for wiring diagrams

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Please send me your free folder on the Kodak Transfax Process.

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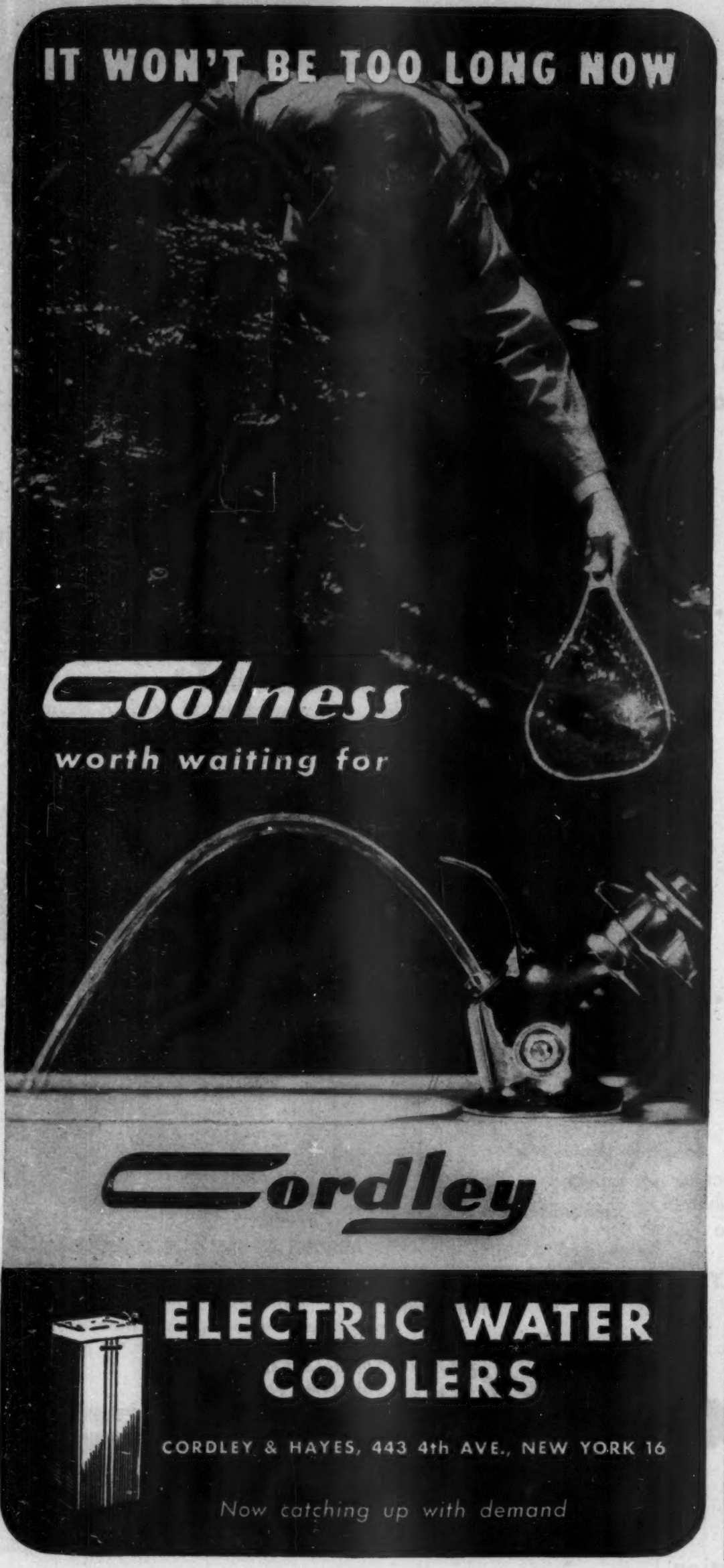
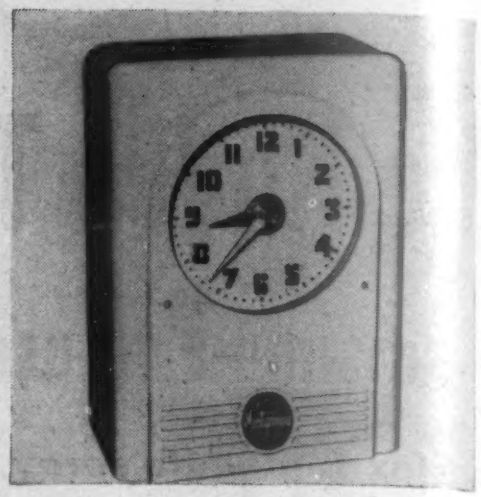
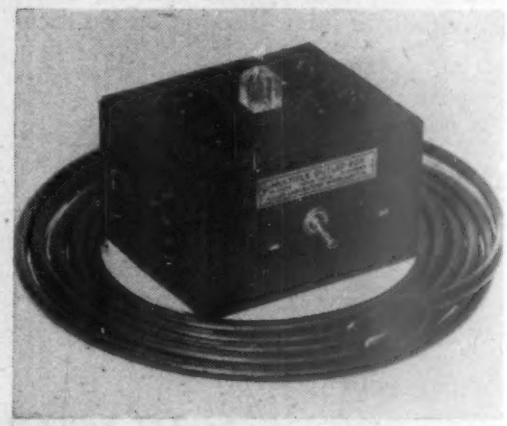




out the automatic mechanism, and a pushbutton permits manual operation of signals. Montgomery Mfg. Co., Dept. 215, 549 West Washington Blvd., Chicago.

MULTIPLE OUTLET BOX

"Multi-Plug" outlet box, Model 3001-A, containing eight standard receptacles, can be plugged into any convenient wall outlet, a.c. or d.c., 110-125 volts. The boxes can be pyramided—one can be plugged into another. Two fuses protect the main line against shorts and overloads. Includes neon pilot light (1/25



watt) which tells a.c. from d.c. and signals "voltage on all plugs," and long stroke toggle switch that breaks both legs of the line. Comes complete with 15-amp. fuses, 12-ft. heavy-duty appliance cord, unbreakable flat plug, and rubber mounting feet. Fuse-extractor posts facilitate replacement. Allied Laboratory Instrument, Inc., 355 West 26th St., New York 1.

CHANGE OF ADDRESS

Clipper Manufacturing Co., maker of masonry cutting tools, announces consolidation, in part, of the St. Louis office with the factory and general office building at 2800 Warwick, Kansas City 8. The St. Louis warehouse will remain at 4030 Manchester as a permanent shipping point for that region.

FORK TRUCK

Telescopic, tilting, hydraulic lift electric fork truck, featuring a lift of 130 inches, can pass through a regular 7-ft. door

Yes, It's A New Method now used on many of our motors to make winding connections *uniform*, mechanically and electrically. How it works: First, we remove insulating varnish from wire ends by a special process. The bright wire ends are then slipped into this tinned-copper connector. There's no twisting, scraping, unnecessary bending.

Then . . . With A Special Tool, we compress — actually "bond" together — each wire and connector into a homogeneous mass. Every connection is precisely the same as every other . . . no brazing or soldering is used . . . no chance to weaken wires or damage insulation. Wires can't pull out or break-off.

Finally . . . We Slip A Tough, flexible plastic protective tubing over the complete connection. Result: when stator windings are impregnated with insulating varnish and baked out, every connection is uniformly sealed and insulated . . . making a stronger . . . more compact and efficient job . . . another factor demonstrating A-C quality.

Here's An Actual Cross Section microphoto that shows, better than I can tell you, just what happens inside the connection itself. Notice how connector and wires are "bonded" into a single mass. Every connection has precisely the same electrical capacity, assuring balanced phasing.

A-C Builds "Quality" Into Motors

YES, PAYING ATTENTION to details like this new, improved connection contributes importantly toward greater reliability, better performance in motors. Next time you want *good* motors, liberally designed, and with an earned reputation for standing up year after year under toughest operating conditions, specify "Allis-Chalmers". For the complete story call your nearby A-C motor dealer or A-C sales office. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A2147

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One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

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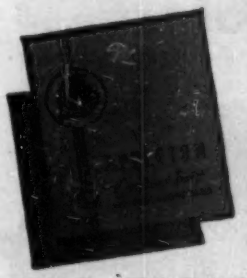
NO CABLE TANGLES, KINKS OR BREAKS

Cranes, hoists, elevators, machine tools, generator sets, lifting magnets . . . all kinds of moving equipment . . . draw uninterrupted power through the Appleton Constant Duty Reelite, with the cable coiled up safely out of the way.

Cable is conserved, danger to personnel and plant from "shorts" is eliminated, costly shut-downs are avoided. Action of the Reelite is entirely automatic; cable is gently taut at all times, paying out or reeling up in harmony with the movement of the equipment served.

Reelites are sturdily built, pay for themselves. They last a lifetime of trouble-free reeling. There is a size and type for every reeling job.

Sold Through Electrical Wholesalers



APPLETON ELECTRIC COMPANY
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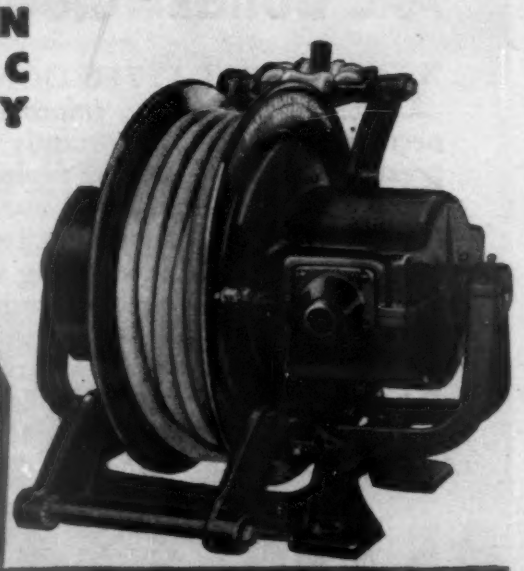
14 Branch Offices and 7 Resident Representatives in all Principal Markets.

SEND TODAY for 50-page Bulletin 504 which gives complete information on Reelites, including special types for air and fluid; or see Sweet's File, Page 2 a/19.



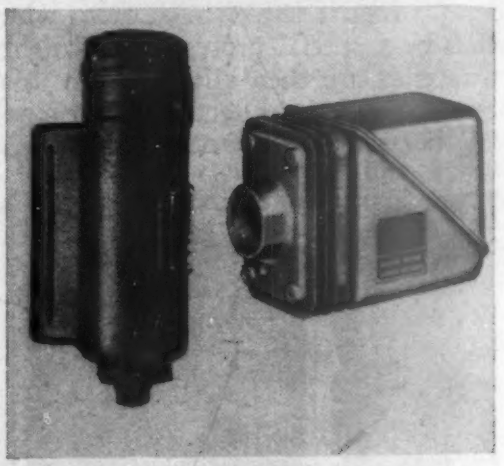
APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REFLECTORS

when collapsed. Called Sky Lift, it operates like an automobile. Pneumatic controller operates as the electric counterpart of an automobile gearshift, and controls include two foot pedals, steering wheel, and two levers. The truck can be started in forward or reverse direction only in low speed. Includes silicone varnish insulation of the electrical system, disk-type traction brake, flow control valves in the hydraulic system, and full "dead man" control. Automatic Transportation Co., 149 West 87th St., Chicago 20.

COMBUSTION SAFEGUARD

Combining in a single unit safeguards against the hazards of flame failure and dangerously low boiler water level in oil-burning equipment, Fireye Type F18TS is an electric eye that instantly cuts off fuel or sounds an alarm when flame fails. It is actuated not by the effect of flame



failure, but by the flame itself. Consists of a phototube and amplifying system housed in a dust-tight aluminum case. The control is mounted directly on the furnace wall. Operates on 115- or 230-volt, 50-60-cycle a.c. Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.

BELT CONVEYOR

Materials can be elevated or lowered on an "off the shelf" conveyor, named Inclinebelt. A rough surface belt is furnished for the conveyor, which is set permanently at 28 degrees. Two belt

"Don't get stung on maintenance, Sir!"

AS MAINTENANCE COSTS go up with steadily rising wage levels and increasing material costs, the repair and upkeep of valves bids fair to outstrip the cost of the valves themselves.

For an occasional faulty valve, this would be a matter of little moment. But when you consider the thousands of valves in an average plant, and multiply by this figure the excessive maintenance demanded by *inferior* valves, you can clearly see that the one sure way to avoid being "stung" on maintenance is by installing the very best, longest-lasting valves that money can buy – Jenkins Valves!

With Jenkins Valves you can be assured of the most dependable operation at the lowest cost – not for just a few months, but for years to come – because superior craftsmanship, quality of materials, and design make Jenkins valves the standard for long trouble-free service.

Millions of Jenkins Valves, now time-proven in actual operation attest this fact, yet you pay no premium for this extra value! *Sold through industrial distributors everywhere.*

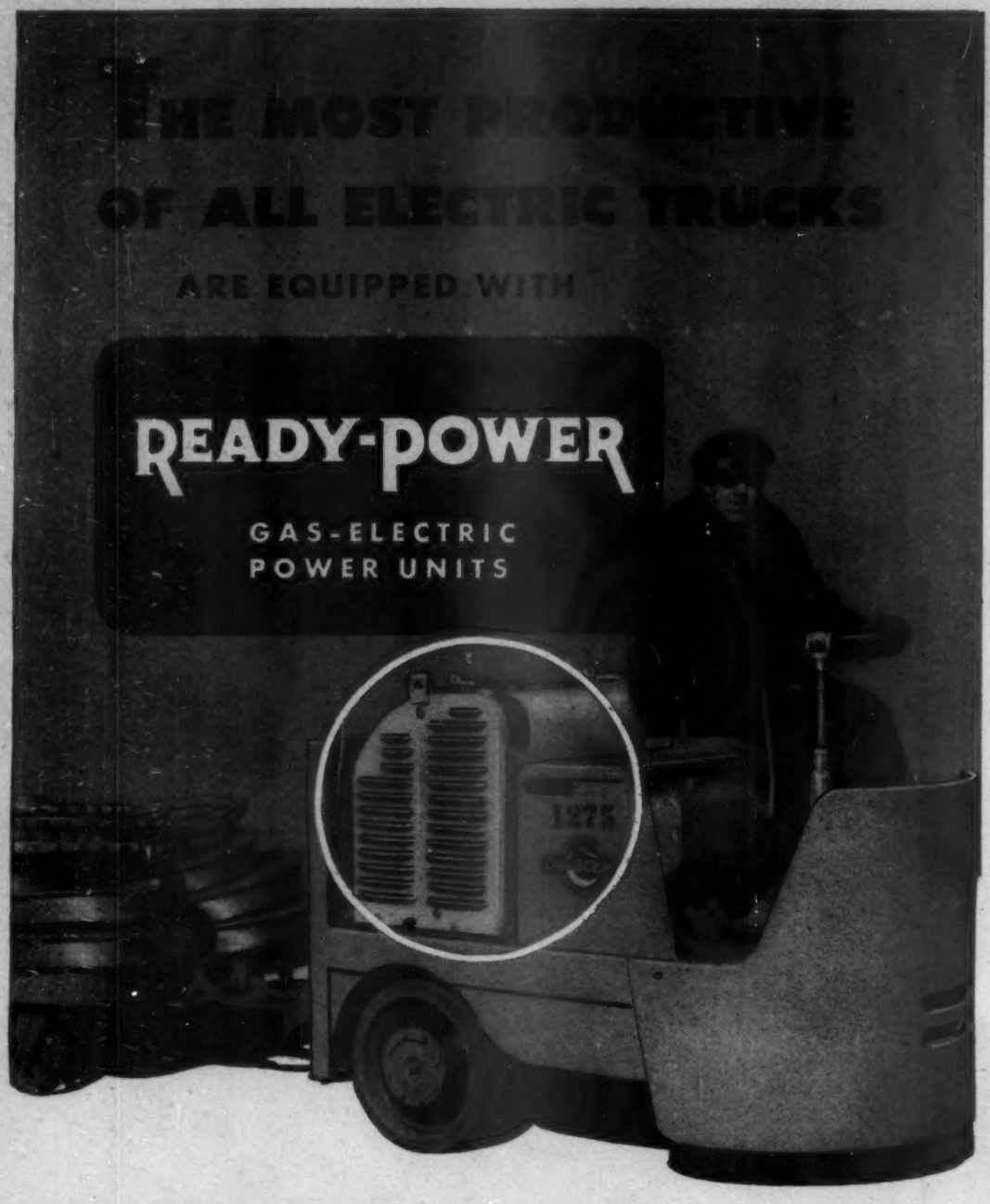
Jenkins Bros., 80 White Street, New York 13; Bridgeport; Atlanta; Boston Philadelphia; San Francisco; Chicago Jenkins Bros., Ltd., Montreal, Canada London, England.

LOOK FOR THIS JENKINS DIAMOND MARK

SINCE Jenkins Bros 1864

JENKINS VALVES

Types, Sizes, Pressures, Metals for Every Need



Electric trucks equipped with Ready-Power Units are industry's most effective materials-handling combination. The reason is simple. Because Ready-Power generates a continuous supply of dependable, live power right on the truck chassis, it permits *full speed* electric operation for an *unlimited number of hours.* Users report as much as 25% to 50% more tonnage handled with lower net costs. Ready-Power Units can be installed on any make truck. There are sizes for all jobs. Convert your present trucks to Ready-Power. Specify Ready-Power on new truck purchases.

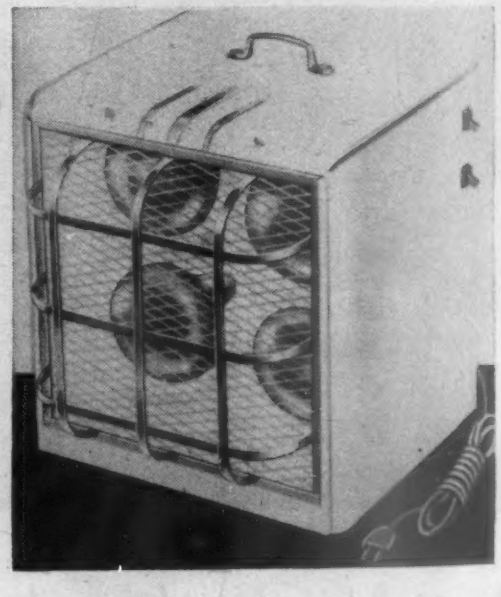
THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

widths are available—14 and 24 inches. Both are made in lengths for 8- to 14-ft., 6-in. floor to floor elevations. Conveyors can be furnished with or without horizontal feed section at the bottom. The top end is curved to provide horizontal feed or discharge of commodities. Motor for the conveyor is supplied in size and type in accordance with local requirements and current available. Standard Conveyor Co., North St. Paul 9, Minn.

PORTABLE INFRA-RED HEATER

Infra-red lamps have been adapted to a portable heater, trademarked Ray Diator, for quick-drying paints and enamels, dehydrating aqueous solutions, and heating rooms. The four replaceable



250-watt natural ruby infra-red lamps have a rated life of 10,000 hours at 115 volts. Operating on a.c. or d.c., the heater is equipped with a 10-ft. cord, and two switches control the heat for 500- or 1000-watt requirements. Duro Test Corp., North Bergen, N. J.

ALARM SYSTEM

The Air-O-Larm, a pneumatically operated mercury switch assembly, provides explosion-proof alarm systems under hazardous conditions at predetermined values of flow, liquid level, temperature, or pressure. The auxiliary switch contacts can be wired to provide visual or audible readings, or both, on any installation with one- or two-pen recorders, indicators, and controllers. The complete

ARE YOU SANDING...
GRINDING...
WIRE BRUSHING...
POLISHING

DO IT BETTER WITH A

SKILSANDER!

A Disc Type SKILSANDER does all these jobs in a faster, easier, better way. You ought to see your distributor today about a demonstration.

DON'T JUST SAND IT... SKILSAND IT!

SKILSAW, INC., 5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities

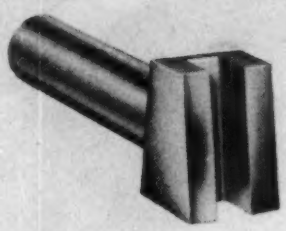
PORTABLE ELECTRIC

SKILTOOLS

SkilSaws · SkilSanders · SkilShear · SkilNibbler · SkilGrinders · SkilDrills

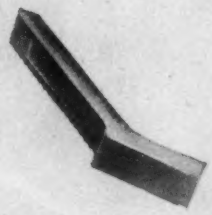
MADE BY SKILSAW, INC.

miracles
and "Soluble" Cutting Compounds



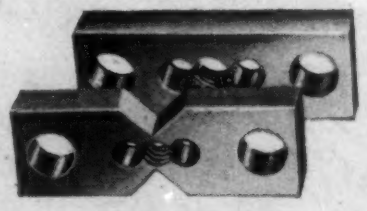
Solvol and KleenKut, Stuart's water-mixed cutting fluids, while they share in many a machining "miracle," are not "miracle" compounds. They *are* expertly engineered and manufactured products, whose performance is unsurpassed among water-mix, or "soluble" cutting fluids.

Stuart's Solvol, a "super soluble" because of its unusually high cutting quality, will handle jobs beyond the scope of conventional water-mix products, including many so-called all-purpose compounds.



Stuart's KleenKut, a more conventional product, is still an outstanding "soluble" cutting compound with a long record of superior performance.

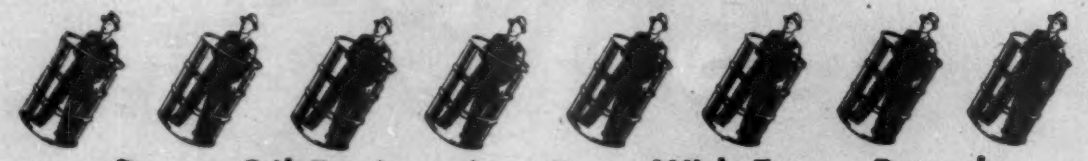
Try Solvol or KleenKut water-mixed cutting fluids the next time you want a machining "miracle."



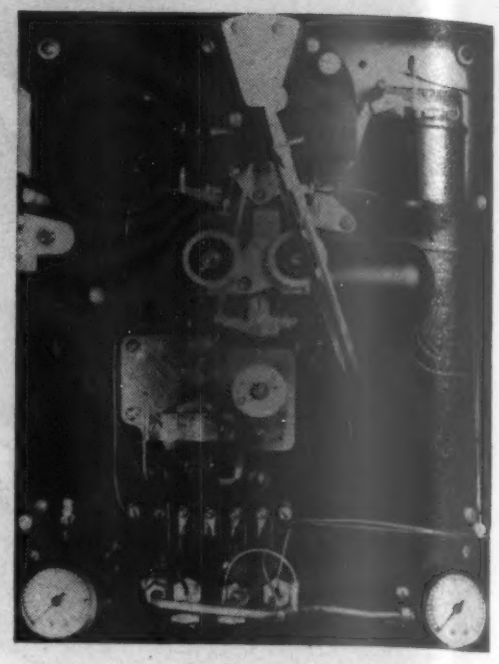
Have you received your copy of "Water-Mixed Cutting Fluids"?

D.A. Stuart Oil Co.
EST. 1865 LIMITED

2735 SOUTH TROY STREET, CHICAGO 23, ILL.



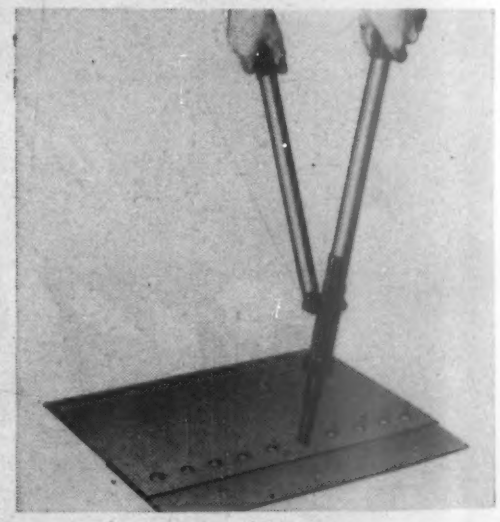
Stuart Oil Engineering Goes With Every Barrel



system consists of a nozzle-flapper mechanism and a bellows-switch assembly mounted as a single unit on either the back of the instrument case or below it. The alarm system is separate from the instrument control system. The unit can be adjusted for different conditions, and construction permits remote mounting. Brown Instrument Co., Wayne and Roberts Ave., Philadelphia.

HAND GUN

Type G-55 hand gun is built for small-quantity use of 7/32-, ¼-, and 9/32-in. blind rivets. When used with an adapter, it installs smaller rivets. Also suitable for field work where air pressure is not



available. The lightweight tool operates on the ratchet principle. It is 29 inches long, including the pulling head, and weighs 4½ pounds. Cherry Rivet Co., 231 Winston St., Los Angeles 13.

MAGNETIC RELAYS

Bulletin 106 midget magnetic relays are adaptable for a.c. or d.c. on standard voltages and frequencies up to 125 volts. Available with single or double pole, and single or double throw silver contacts. Single break contact ratings for standard relays are 4 amperes, 125 volts, a.c., 60 cycles on non-inductive loads. The relays are of the open type mounted on a

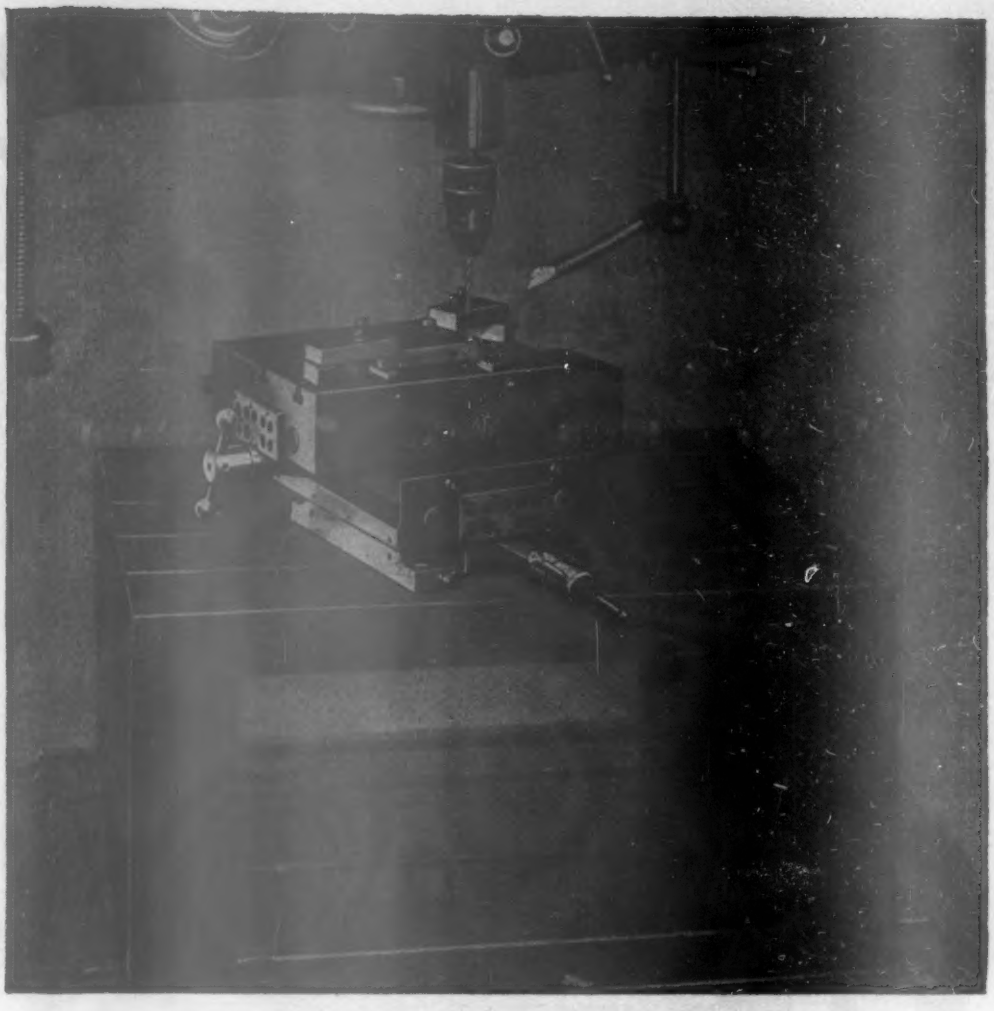
NOW . . .

without JIGS

. . . . *you can drill, bore, ream and tap*

. . . *small work*

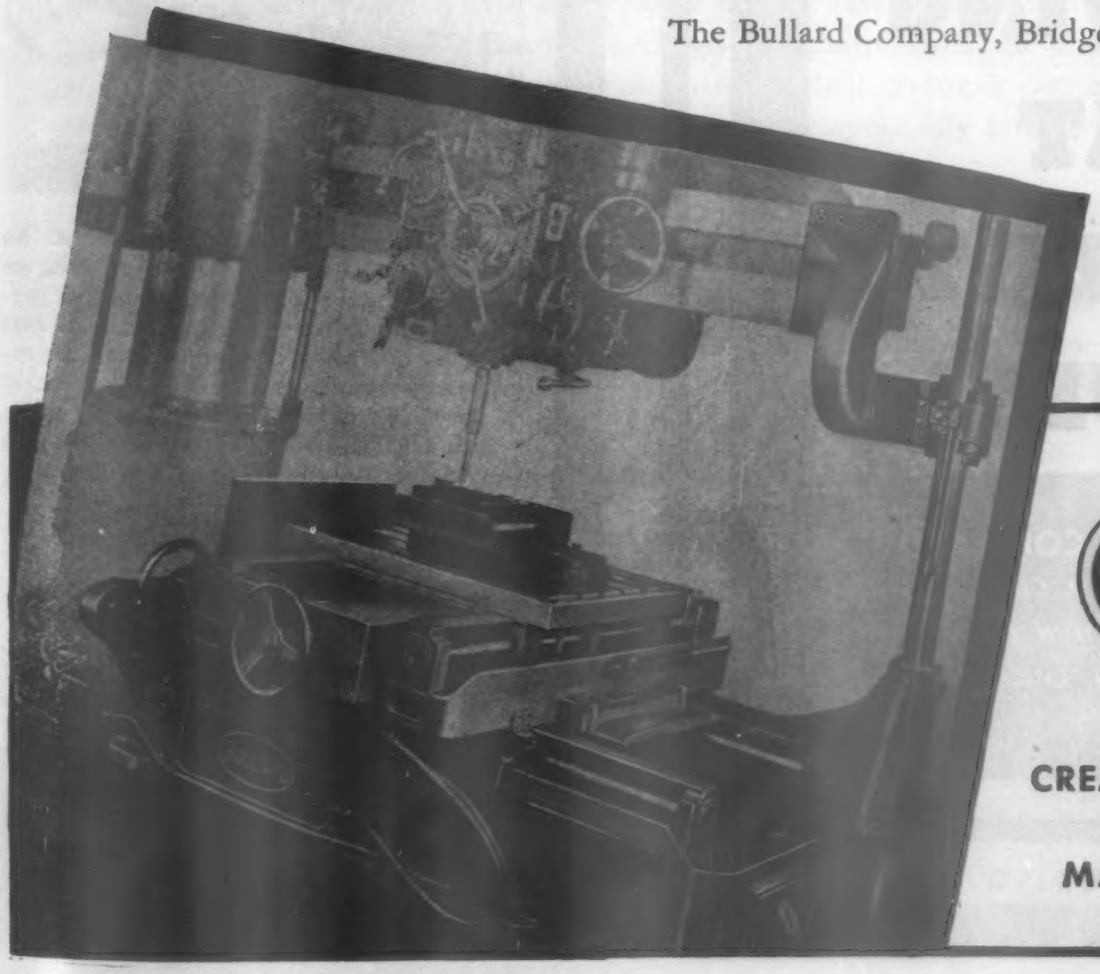
The new 4″x 4″ Bullard MAN-AU-TROL Spacer for speedily and accurately locating holes within a 4″x 4″ area . . . for use on smaller sensitive drills but usable on larger drills as shown. Its hydraulic unit will operate four 4″x 4″ Spacers if you so desire.



. . . as well as
LARGE WORK

The new 30″x 20″ Bullard MAN-AU-TROL Spacer for accurately repeating a pattern of holes within a 30″x 20″ area . . . for use on radial drills.

BOTH the 4″x 4″ and 30″x 20″ Bullard MAN-AU-TROL Spacers give you such benefits as: elimination of expensive jigs . . . no production tie-ups for making jigs . . . straight holes 90° to the work . . . prevention of strain on drill spindle and reduction of drill wear because of perfect tool centering . . . less operator fatigue. Write for MAN-AU-TROL Spacer Bulletin. The Bullard Company, Bridgeport 2, Connecticut.



Typical Installation of 30″x 20″ MAN-AU-TROL Spacer.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

DARNELL

CASTERS

A SAVING AT EVERY TURN

DARNELL CORP LTD
LONG BEACH 4 CALIFORNIA
60 WALKER ST NEW YORK 13 N Y
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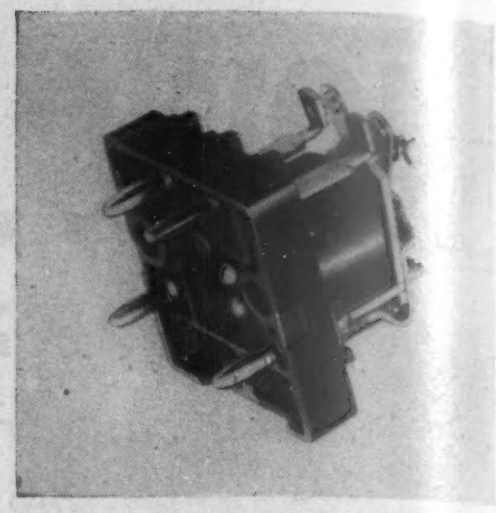

molded phenolic insulating base, and may be supplied with enclosures. They can be furnished for two or three-wire instrument control. Pin plug connectors permit mounting by plugging the relay in receptacles installed in the panelboard. Ward Leonard Electric Co., Mt. Vernon, N. Y.

BLAST CLEANER

Blast-cleaning unit has a vacuum return system that allows cleaning or refinishing of metal, concrete, and other hard surfaces without the necessity of a sand-blasting room. Operated similarly to a vacuum cleaner, the machine may be used for removing corrosion, paint, stains, and other deposits, without special precautions or preparations. No masks, goggles, or protective clothing are needed, and the maker claims that precision machinery or other products next to an operating blaster need not be removed or covered. Various types of abrasives may be used, depending on the job. Grit and refuse are returned to the reclaiming tank. Vacu-Blast Co., Inc., Burlingame, Calif.

ELECTRONIC COUNTER

Single channel predetermined counter, Model 140, counts and controls sheet metals, hardware, cartons, and similar items at rates of 15,000 per minute and higher. Dial switches on front panel of the instrument set the desired count. When the predetermined number of items has been counted, the unit actuates a control to stop or divert the flow of materials automatically. Can be set to recycle automatically, or manually

ROUGH FILING calls for TOUGH FILES

SNAGGING a rough casting with an ordinary file is a sure invitation to headaches—*and "toothaches"!* Hard projections and sharp edges put a severe strain on regular file teeth—often cause them to shell or break out under pressure. Roughing-down calls for a file with an exceptionally strong tooth construction.

The right file for the job is the Nicholson or Black Diamond Special Purpose Foundry File, with extra-sturdy teeth designed to absorb shock and resist breaking. Specializing in rough use—like knocking fins and sprues off foundry castings or filing the narrow edges and sharp corners of dies—this "bruiser" of the file family continues to give efficient service long after regular files have been discarded.

Made in Flat and Half Round shapes, sizes 8″ to 14″. Stamped "Foundry."

• **OTHER NICHOLSON AND BLACK DIAMOND SPECIAL PURPOSE FILES** include files for: Aluminum, Stainless Steel, Brass, Lead, Die Castings, Die Making, Lathe Filing, plus milled Curved Tooth files and a wide range of Swiss Pattern precision files. Order through your industrial distributor.

NICHOLSON U.S.A. **NICHOLSON FILE CO.** • **27 ACORN STREET, PROVIDENCE 1, R. I.**
(In Canada, Port Hope, Ont.)

BLACK DIAMOND TRADE MARK

NICHOLSON FILES FOR EVERY PURPOSE

Lifts, carries, tiers, loads of 1000 lbs. to 84"

CLARK TRUCLOADER

light, compact, fast, designed for operating in and out of trucks, trailers, low-capacity elevators and general material handling operations. Gas and electric powered.

TO SEE CLARK TRUCLOADERS AT WORK IN BUSINESSES LIKE YOURS SEND FOR NEW PICTORIAL LITERATURE.

Visit National Material Handling Exposition Cleveland... January 14-17

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BATTLE CREEK, MICHIGAN
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FORK LIFT TRUCKS
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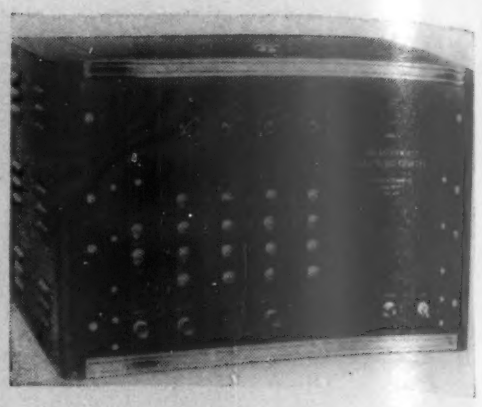
METAL SPOKE WHEELS
AXLES & HOUSINGS
TRANSMISSIONS

Prices on CLARK products will not be advanced in excess of increased costs.



by a remote control switch. The unit utilizes four 4-tube counter decades for setting from 0 to 10,000. Other models are available for control of two-step sequential processes. Potter Instrument Co., 136-56 Roosevelt Ave., Flushing, N. Y.

FIRE EXTINGUISHER

Containing 5 pounds of carbon dioxide, portable fire extinguisher weighs only 15½ pounds. Increased cardon dioxide content in the unit provides added protection to small hazard areas, and reduc-

tion in weight facilitates handling. Other portables available are in 2½-, 10-, 15-, and 20-lb. sizes; wheeled units in 50-, 75-, and 100-lb. sizes. Walter Kidde & Co., Inc., Belleville, N. J.

RUBBER-FRAMED GOGGLE

Equipped with a large, single acetate lens, rubber-framed goggle is designed to protect workers against chemical and

*Gas-fired polymerizing oven being charged with plastic-coated aluminum flue liners.**

gas and plastics change the face of things

*Properly baked, this plastic finish resists cracking.**

Plastic coating of metal parts expands the whole field of applications for both metals and plastics. By varying the chemical composition of the plastic an infinite variety of new surfaces can be created for metals.

An essential element in the perfect union of metal and plastic is heat—clean, dependable, accurately-controlled heat—the kind obtained with modern Gas-fired ovens.

Experienced producers of plastic-coated metals, such as Heremetal Company, Minneapolis, Minnesota, use GAS for polymerization ovens because GAS insures the uniform heat, rapid response to heat control, and exact temperatures so essential to processing.

Wherever there's a difficult industrial heating problem there's a job for GAS. Don't forget that the Industrial Representative from your local Gas Company will give you up-to-date information on the latest developments of Gas equipment for your heating requirements.

**Photos courtesy of Despatch Oven Co., Minneapolis, Minn.*

MORE AND MORE...

THE TREND IS TO GAS

FOR ALL INDUSTRIAL HEATING

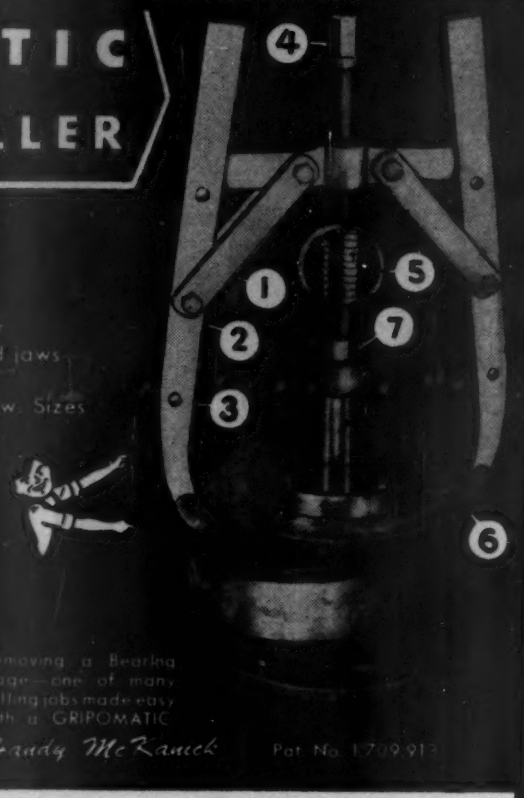
AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE, NEW YORK 17, N.Y.

GRIPOMATIC

Exclusively an OTC PULLER

1. Patented linkage gives non-slip grip
2. Bolts act as safety link
3. Quickly adjustable for length
4. High alloy steel screw and head
5. Power pitch screw, 32% more power
6. High alloy, drop forged, heat treated jaws thinner, stronger, safer
7. Self-centering dog point forcing screw. Sizes for all needs—up to 50 ton capacity



Removing a Bearing Cage—one of many pulling jobs made easy with a GRIPOMATIC

Freddy McRanch Pat. No. 1,709,913

OTC PULLING SYSTEM

Engineered for DEPENDABILITY

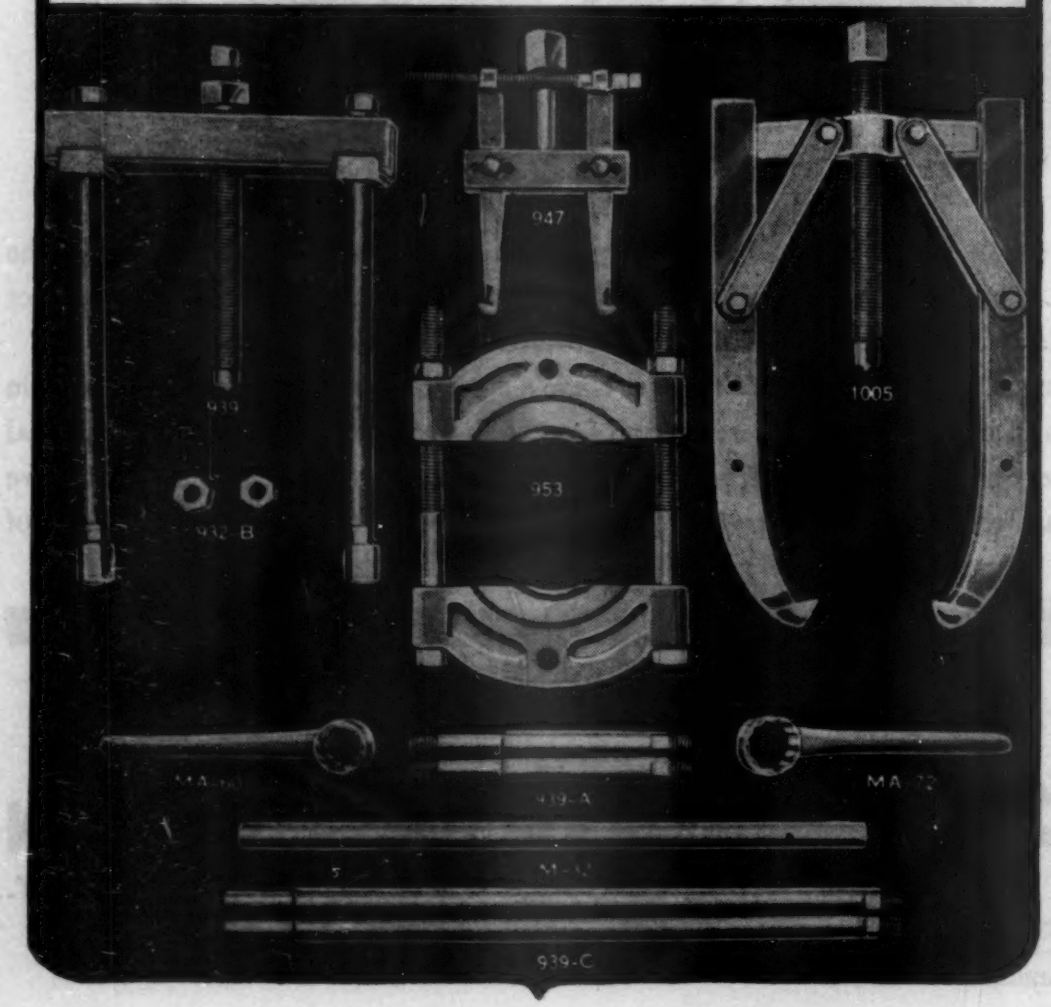
In Pulling Gears, Bearings, Sheaves, Pulleys, Wheels, Shafts, and Tight Parts—Easily, Safely

OTC INDUSTRIAL MAINTENANCE SET NO. PE-20—shown below—provides complete heavy duty pulling equipment for large machinery. Other Sets to meet all needs.

ASK YOUR SUPPLY HOUSE for OTC Industrial Maintenance Bulletin No. PE-1946—a helpful manual on pulling jobs.

Look for THIS SIGN

OWATONNA TOOL COMPANY
363 CEDAR ST. • OWATONNA, MINN.



dust hazards. Providing wide-angle vision, the ventilated goggle may be worn directly over the eyes or over prescription glasses. Suitable for wear on jobs requiring handling of acids and caustics, protecting against chemical splashes, spray, impact of foreign particles, as well as exposures to fine dust concentrations. The closely fitting frame is molded from non-irritating, acid-resisting synthetic rubber, perforated at top and sides for ventilation. American Optical Co., Southbridge, Mass.

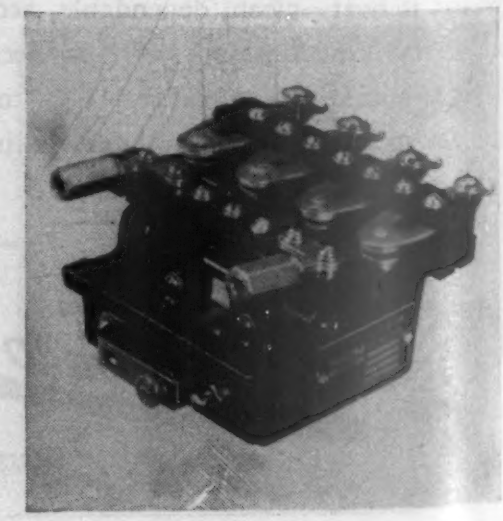
SWIVEL PIPE COUPLING

All-Flex ball-bearing swivel pipe coupling is designed for conveying fluids under high pressure through a pipe that swivels or rotates a full 360 degrees. Multiple synthetic packings and metallic seals offer protection against leakage at

high and low pressures. Double row of ball bearings, plus metal-backed packings, give low resistance to rotation. Torque is said to be 2.5 inch-pounds at 1500 p.s.i., and 9.6 inch-pounds at 3000 p.s.i. Made of steel, coupling is available in from ⅛- to 1-in. nominal tube size, with various threaded and elbow connections. Snyder Sales Corp., 5225 Wilshire Blvd., Los Angeles 36.

HEAVY-DUTY RELAY

Multiple arm relays have a contact capacity of 50 amperes at 115 volts a.c. or 24 volts d.c. Contact arrangement is double-pole single-throw, with two



He writes only in RED INK!

INADEQUATE WIRING, the industrial jinx, embezzles millions every year. It would take quarts of red ink to record the toll he takes in unproductive wages, lost production and spoilage.

For, when he attacks, through overloaded, over-extended, obsolete wiring, efficiency can drop from 25 to 50 percent.

To shut out this costly scribe, talk to your plant power engineer, consulting engineer, electrical contractor or power salesman.* They can write him off... before he gets into your books.

47434

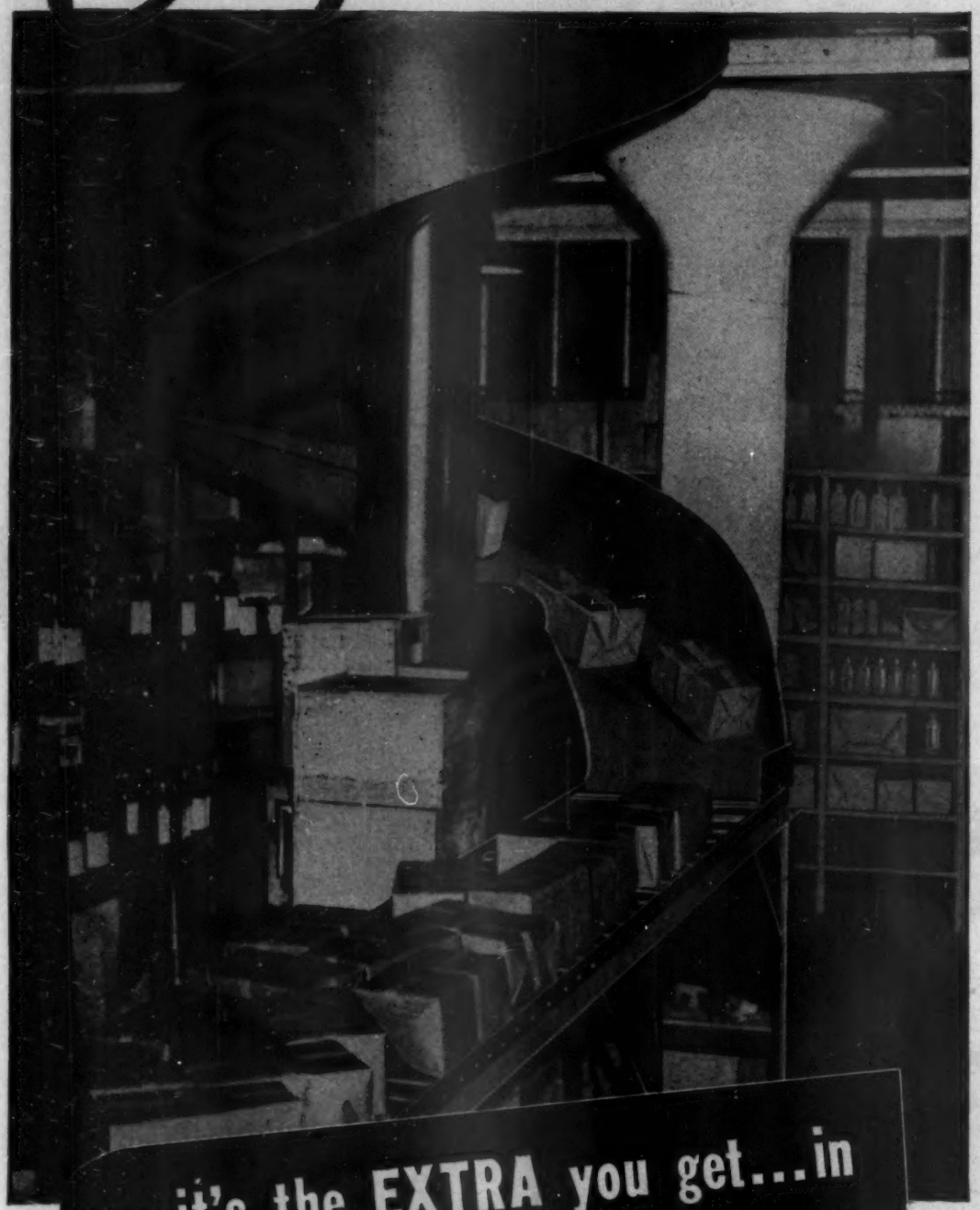
Because adequate wiring is basic ... and affects everyone in our industry ... Anaconda continues to promote this idea in a wide list of national magazines.

*WIRE AHEAD, a new booklet discussing preventive maintenance... the symptoms of inadequate wiring... and presenting plans for anticipating electrical demand, is now in preparation. We shall be glad to send it on request as soon as it is available.

ANACONDA
from mine to consumer

ANACONDA WIRE & CABLE COMPANY

Engineering IS OUR BUSINESS..



...it's the EXTRA you get...in Logan Conveyors

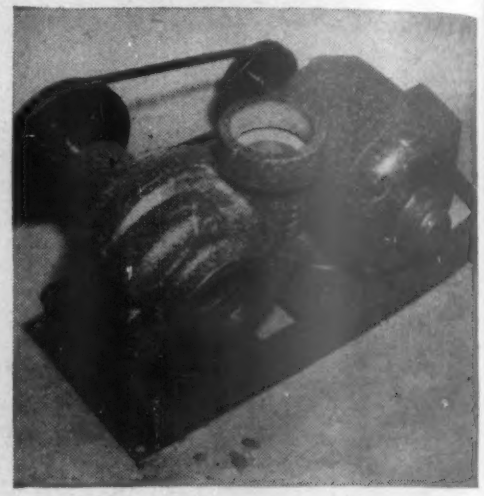
John Q. Public selects a particular motor car — radio — or washing machine, because of extra features he desires. Buyers of industrial equipment do likewise. That is why Logan Conveyors, with a plus emphasis on engineering, are so frequently specified in the nation's leading industries. This "engineering extra" means maximum production economies in time, effort, space, and employee satisfaction, with a Logan installation.

LOGAN CO., INC., 518 CABEL ST., LOUISVILLE 6, KY.

breaks per pole. Relay has a rigid cast aluminum frame which is black anodized. Armature is carried on a stainless steel shaft and counterbalanced to minimize effect of shock and vibration. Electrical contacts are of silver or special alloys, as required. Magnetic circuit provides high working pressures at the contacts, with a power consumption of less than 3.5 watts on d.c. coil windings, and 8 watts on a.c. coils. Signal Eng. & Mfg. Co., 154 West 14th St., New York 11.

CENTRIFUGAL PUMPS

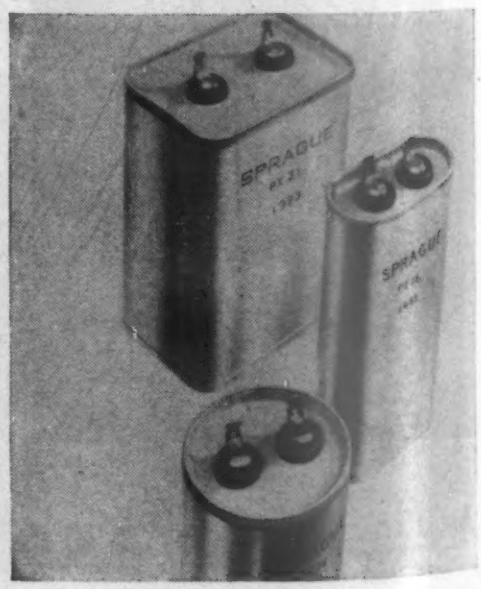
Line of cast iron bronze-fitted, pedestal-type centrifugal pumps, known as Pedrifugal, comes in three sizes—1x1, 2x2, and 3x3 inches. Capacities are from 10 to 500 g.p.m. at heads from 10 to 100 feet, with power requirements from ¼ to 15 horsepower. Designed for use with



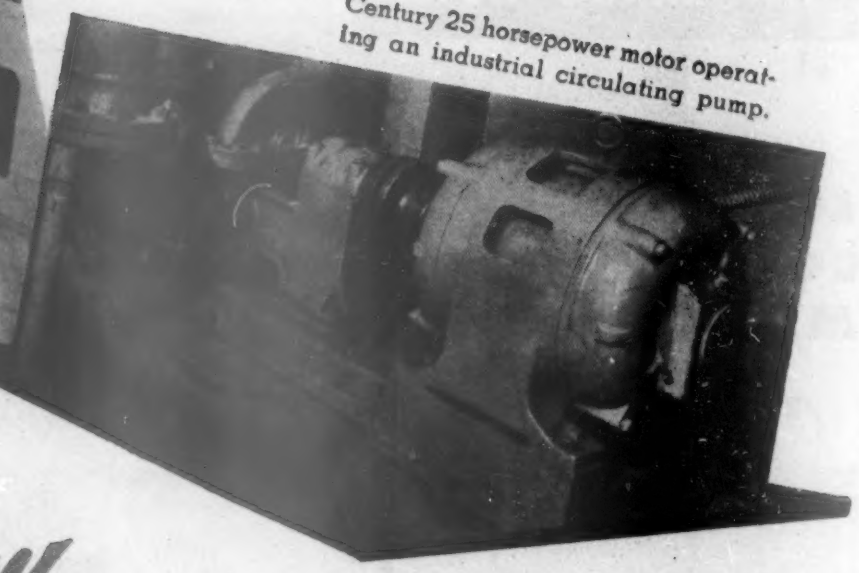
Texrope V-belt drives, pumps give a range of capacities regulated by size of sheaves and power supplied. The units are sold without motors for use with any suitable available power. However, the pump, steel base, motor, and drives can be supplied as a unit, or as separate items. Allis-Chalmers Manufacturing Co., Milwaukee.

FLUORESCENT BALLAST CAPACITORS

Fluorescent lamp ballast capacitors made with manufacturer's Vitamin Q dielectric are claimed to be thermally



A city water works uses a Century 150 horsepower motor.

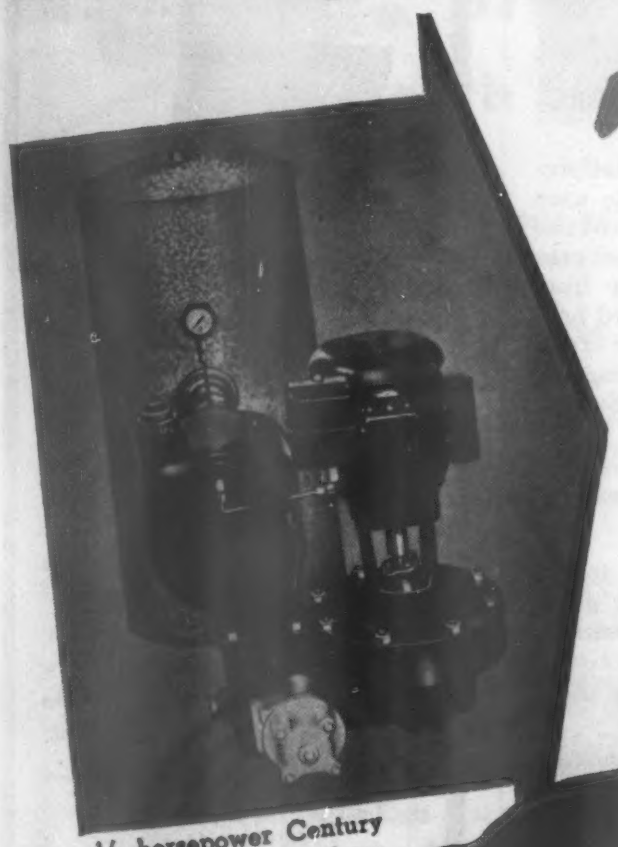


Century 25 horsepower motor operating an industrial circulating pump.

Century

Moisture Protected PUMP MOTORS

Assure Dependable Power for Water Supply



¼ horsepower Century motor operates a farm water system.

- On Farms
- For City Water Supply
- In Industrial Plants
- For Fire Protection

Century's triple insulation is especially effective in resisting high humidity and dampness — thus the windings are protected against premature deterioration.

Hundreds of thousands of Century motors are providing a long life of satisfactory service on pump installations of many kinds and sizes, from small fractional horsepower farm water systems to large city and industrial pumping plants.

They start quietly, run quietly and with an unusual freedom from vibration.

Century motors are built in a wide range of types, in sizes from 1/6 to 400 horsepower — for any type of pumping service — in any climate — and all other electric power applications. Specify Century motors for all your electric power requirements.

Century C MOTORS

503

CENTURY ELECTRIC COMPANY 1806 Pine St., St. Louis 3, Mo.

Offices and Stock Points in Principal Cities

AVAILABLE NOW!

5 WAYS TO LOWER ASSEMBLY COSTS WITH ONE MACHINE----

THE MILLIKEN PRECISION NAILER-PINNER

1. Replaces hand work in assembly
2. Needs no skilled operators
3. Increases production—lowers unit costs
4. Pays for itself quickly—low initial cost
5. Requires little maintenance—uninterrupted operation

Drives Nails, Pins, Rivets, or Drive Screws in Hardwoods, Metals, Plastics, or Composition.

Write for Bulletin

Hastings SALES ENGINEERING CO.

KENMORE SQUARE BOSTON 15 MASS.

stable at temperatures and voltages far in excess of those met under severe fluorescent ballast operating conditions. Sprague Electric Co., North Adams, Mass.

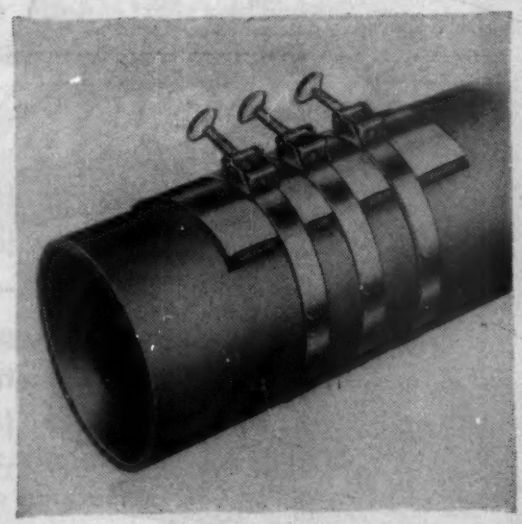
SWING STAGE

Men working on scaffolds above ground level are said to be afforded safety, ample working space, and a quick, easy means of ascent and descent with the Saf-T-Swing Stage. The gear-operated winch permits use of a $\frac{5}{16}$-in., 6x19, mild plow steel wire rope. Each of the two winches is equipped with 150 feet of cable. The

stirrup, which accommodates a platform up to 28 inches wide, is bolted to each winch, and can be removed. A guard rail post is welded to each stirrup. Steel gear housing prevents foreign matter from entering the gears, and gives added protection to the operator. Gear-type crank handle permits raising or lowering the swing 75 feet in 10 minutes. Safway Steel Prods., Inc., Milwaukee.

PIPE-LEAK CLAMP

Featuring a Hycar pad resistant to deterioration by water, gas, oil, or gasoline, pipe-leak clamp is made of stainless



steel. An annealed backing plate covers the pad and can be hand-formed to the desired pipe contour. Pad and patch plate are secured over lead with universal stainless steel clamps of the con-

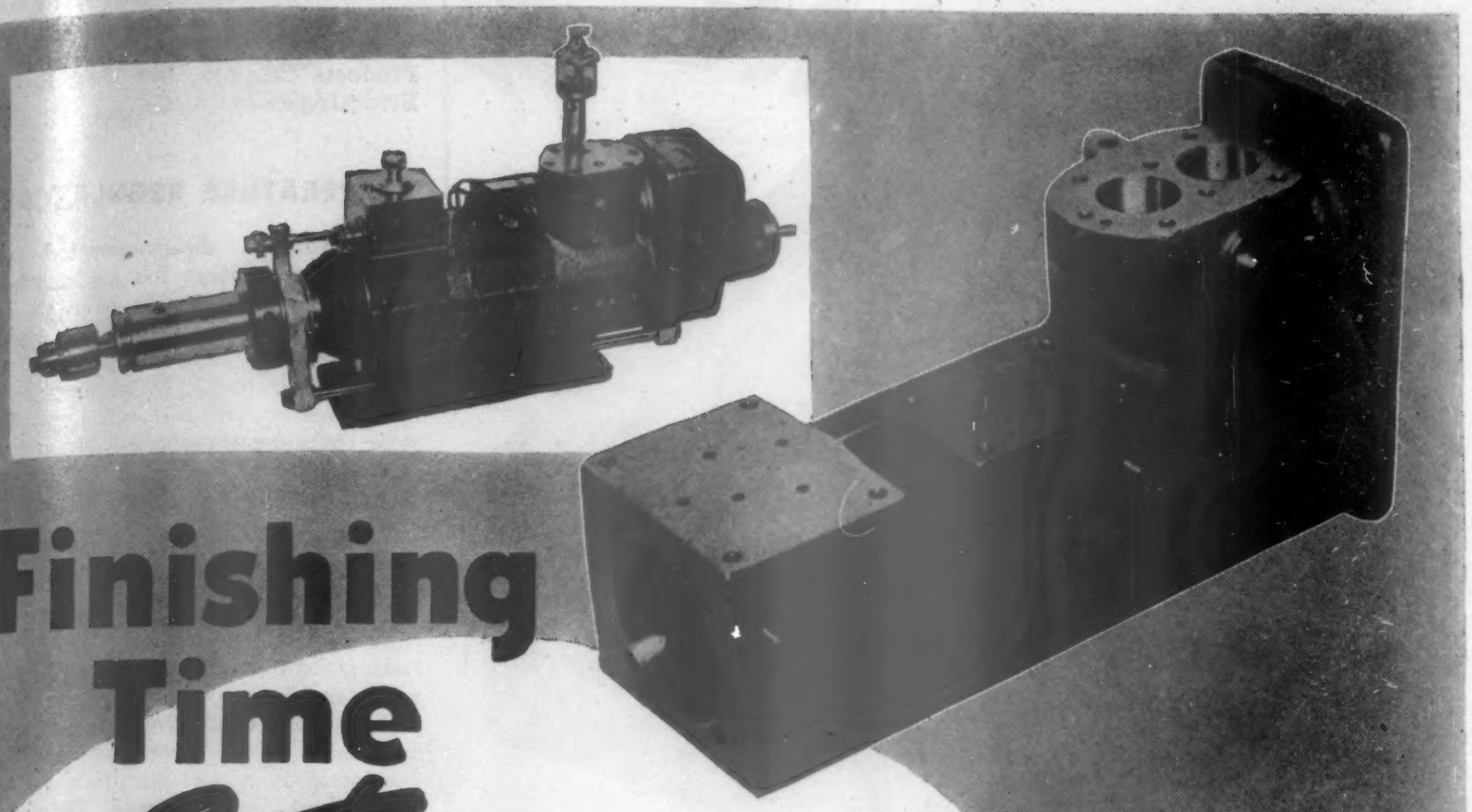
Lifts 25 Tons a Full 10¼ Inches with Great Ease!

Simplex No. 2522 Jack. Capacity 25 tons; height 22"; lift 10¼"; toe lift minimum 4⅜"; weight 140 lbs.

There are so many heavy lifting and moving jobs for which the Simplex Standard Speed Ball Bearing Industrial Jack is "tops" for ease, speed and safety. No. 2522 lifts its full rated capacity on the cap or the broad toe lift (10 sq. in.). Affords greater clearance above ground for easier operation because the enclosed ratchet mechanism is at the top of the Jack, instead of in the base as in journal Jacks. Send for Catalog 45.

Templeton, Kenly & Co.
Chicago 44, Ill.
Better, Safer Jacks Since 1899

SIMPLEX
WORLD'S MOST COMPLETE LINE OF
JACKS
LEVER
SCREW
HYDRAULIC



Finishing Time *Cut* from 2 hours to 10 minutes

with Sunnen Precision Honing Machine

In addition to their tremendous saving in honing time, speed of assembly of parts was increased up to 300%; breakdowns were greatly reduced because parts now wear longer. So, finishing costs have naturally dropped to about 1/10th of the former cost (exclusive of material).

This part from a pneumatic drilling and tapping unit is made of cast iron—has one large blind hole 2⅛" in diameter and two open holes 1" in diameter. Tolerances are held to within .0005" and a 15 micro-inch finish is produced.

Here are *other* advantages you get from using this machine:

Handles wide range of sizes, from .125" to 2.625" • Produces accurate holes within .0001". • Can be set up, ready to operate in 1 minute Does not require skilled labor • Low in cost, economical to operate

Find out how these advantages can save time and money in your shop. Call in a Sunnen engineer, or write for complete details. If you have parts on which you would like recommendations, send them to the Sunnen Honing Laboratory.

SUNNEN PRODUCTS COMPANY

7938 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

SUNNEN

TRADE MARK REG. U.S. PAT. OFF. – MARCA REGISTRADA

166

Typical Jobs

Cast Iron Valve Stem Guide. ½ to one thousandth removed —220 pieces per hour. Better finish and straighter hole.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Roller Bearing Outer Race. Finish improved from 12 micro inches to 2 micro inches.

Compressor Yoke. Alignment maintained and better finish produced.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

SAVE TIME...

3 WAYS

with ROPER ROTARY PUMPS

1. Four-port design offering eight optional piping connections cuts installation time and cost. Four piping arrangements are possible with pump operating clockwise . . . 4 other arrangements with pump operating counter clockwise.

2. Hydraulic self-lubricating principle prolongs pump life with less service attention. There is positive continuous bearing lubrication. Liquid pumped enters grooved bearings from pressure side, is drawn to suction side through grooves in opposite bearings.

3. Easy accessibility to working parts cuts down "out-of-service" time. It is not necessary to disturb piping, power unit, or pump mounting to inspect or replace gears, case, bearings or packing.

Send for Bulletin of Pumping Facts.

GEO. D. ROPER CORP., 181 BLACKHAWK PARK AVE., ROCKFORD, ILL.

Builders of Pumps for Manufacturing, Marine, Petroleum and Process Industries.

Capacities ¾ to 300 G.P.M.; pressures up to 1000 P.S.I.; speeds up to 1800 R.P.M.

ROPER Rotary Pumps

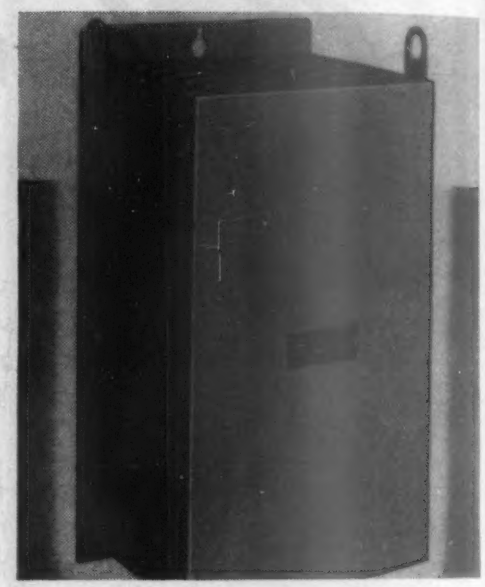
tinuous band type, which have a size range from 9/16 inch up to the maximum diameter for clamp. Marman Products Co., Inc., 940 West Redondo Blvd., Inglewood, Calif.

TEMPERATURE REGULATORS

Self-contained, direct-operated temperature regulators for gas control to process heating operate over standard temperature ranges from 20 to 600 deg. F., at inlet pressures up to 25 p.s.i. Various bulb and bulb casing materials are available, and the liquid expansion type thermostatic element has a piston guided bellows. Leslie Co., 112 Delafield Ave., Lyndhurst, N. J.

TRANSFORMER

Constructed throughout with Class B heat-proof insulation, such as fiberglass, mica, and asbestos, a lighting and general purpose transformer is claimed to withstand severe operating conditions. Insulation is said to eliminate need for liquids and fireproof vaults. The electri-



cally welded steel case enclosing a compact element also acts as a wiring compartment accessible through knockouts. Available in sizes up to 500 kva. in voltages to 13,200. Stock rating 240/480 primary, 120/240 secondary, 60 cycles, single phase. Marcus Transformer Co., 32-34 Montgomery St., Hillside 5, N. J.

GASOLINE HOSE

Light weight, flexibility, and softness are featured in an oil and gasoline hose developed for use in unloading oil trucks

THOMAS JEFFERSON
Third President of the United States

The Bettmann Archive

LEADERSHIP

Extracts from Jefferson's First Inaugural, 1801

"It is proper you should understand what I deem the essential principles of this government and consequently those which ought to shape its *administration* . . .

"Equal and exact justice to all men . . . Peace, commerce, and honest friendship with all nations . . .

"The support of the state governments in all their rights . . .

"A jealous care of the right of election by the people . . .

"The supremacy of the Civil over the Military authority . . .

"Economy in public expense that labor may be lightly burthened . . ."

1st in a series on Thomas Jefferson, Third President of the United States

Such wise and understanding Leadership continues to serve as an inspiration to those who keep faith with the enlightened principles pioneered by this great and true American.

With thoughtful appreciation, therefore, of the heritage attached to the name Jefferson, the founders of this company accepted it as best symbolizing their ideals and policies. Since then the Leadership of the Jefferson Electric Company, in its chosen field, has progressed through a consistent adherence to truth and dependability in all business transactions.

***TRANSFORMERS:** Power Circuit, Mercury Lamp, Oil Burner Ignition, Control, Bell Ringing, and Luminous Tube.*
***FUSES:** Jefferson-Union Renewable Fuses, Super-Lag, and Non-Renewable. BALLASTS for Fluorescent Lamps.*

JEFFERSON ELECTRIC COMPANY

BELLWOOD, ILLINOIS *(Chicago Suburb)*

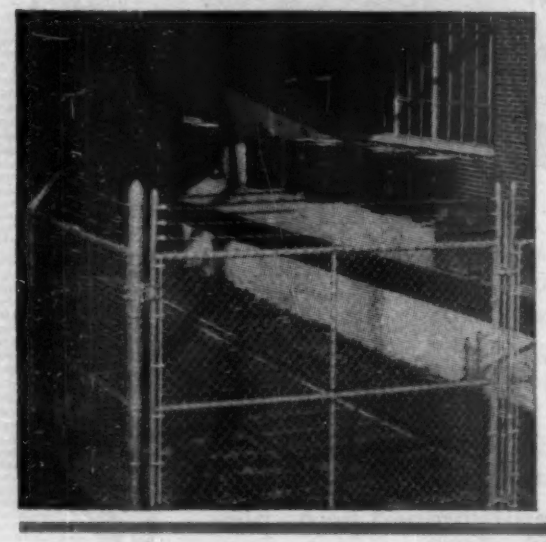
In Canada: Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.

JEFFERSON ELECTRIC

Safety and Protection
MORE IMPORTANT THAN EVER

THE ONLY CHAIN LINK FENCE MADE OF * KONIK STEEL

KONIK is the registered tradename for the patented steel containing copper, nickel and chromium used in Continental Chain Link fence fabric. KONIK possesses a greater tensile strength and higher elastic limit and is rust-resistant "clear through." All the extra value of this modern steel now comes to you only in Continental Chain Link fence.



ENGINEERED FOR PROTECTION

Continental fence has 14 distinctive construction features including heavier line posts . . . stronger and more easily operated gates . . . improved pivot-type hinges . . . self-locking barb arms . . . and 20% more ties . . . fabric of rust-resistant, full gage wire of KONIK steel with heavy uniform zinc coating. Continental fence combines style with durability and positive protection for your property.

TAILORED TO FIT YOUR PROPERTY

Experienced fence engineers plan and help erect Continental Chain Link fence anywhere. No matter what your property protection problem, Continental fence is designed for your installation, then custom-built for quick erection on the site. Correct and economical construction can be done by trained erection crews. When local labor is to be used, Continental can supply a competent foreman and inspection service. *Write for FREE fence manual.*

*TRADE MARK REG. U. S. PAT. OFFICE

CONTINENTAL STEEL

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF STEEL SHEETS, including Continental GALVANIZED, COPPER-STEEL Galvanized, KONIK steel sheets Galvanized, UNIFORM SPANGLE Galvanized, DULL COAT, Continental GALVANNEALED, ELECTRICAL, Hot Rolled Pickled, and many styles of Formed Roofing. ALSO, Manufacturer's Wire in many sizes, shapes, tempers, and finishes, Continental Chain Link Fence, Nails, and other steel products.

and tank cars. Hose consists of two plies of Ustex, a chemically treated textile claimed to be 70 percent stronger than standard cotton yarn. The hose is lined with a synthetic rubber compound which resists aromatics and high octane fuels. United States Rubber Co., Rockefeller Center, New York.

TOTEBOX TRUCK

"George" is a truck for moving boxes containing compact, heavy loads of metal parts. Consists of a strong metal frame holding two sets of ball-bearing rollers. The load rests on one set, and the other

set rolls it to its destination. A traction-hook fits through any one of a series of holes in the handle to accommodate height of boxes, to be rolled onto the frame. Rolock, Inc., Fairfield, Conn.

SWITCHBOARD TACHOMETER

Five heads and three speed ranges are incorporated in switchboard tachometer Type 40E. Permanently mounted at different machines, the heads are wired to the central indicating unit by ordinary BX cable or conduit. Rotary selector switch on panel of indicating unit selects the machine for speed measurement. The machines may be remote from the location of the indicating unit, even in different buildings. The three separate

INSIDE THIS HOUSING there's

real Economy —plus LONG LIFE

. . . because, in the design of Philadelphia Worm Gear Units, factors that cause wear have been eliminated, and the adequately proportioned housings permit proper heat radiation without sacrificing compact construction. Of course, the ball or roller bearings on which both worm and gear are mounted are generously proportioned. The worm itself, is of case-hardened alloy steel with precision ground threads—while the worm gear is made of "special analysis" chill cast bronze—and, an oil bath in which the worm revolves, also provides lubrication for the gear and bearings.

Philadelphia Worm Gear Units are available in all sizes, types and ratios . . . Send for complete Catalog #26, and please use your business letterhead when requesting same.

Philadelphia
GEAR WORKS INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO . . . IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Colloidal graphite – "dag" of course
Has uses by the score.
We're sure that if you knew them all
You'd wind up using more!

Here are the
main fields of usefulness
for dag colloidal graphite
CHECK THOSE WHICH FIT YOUR NEEDS
and we'll send complete literature

- PARTING COMPOUNDS ☐
- DRY-FILM LUBRICATION ☐
- IMPREGNATION of fabrics, porous metals, leathers, etc. ☐
- PRESS FITTING ☐
- LUBRICANTS for forging, drawing and extruding ☐
- OIL ADDITIVES for boundary conditions ☐
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dag COLLOIDS
ACHESON COLLOIDS CORP.
Port Huron, Mich.

☐ Send me your new 16-page data and reference book (below) which gives full particulars on the 18 most-used dispersions of "dag" colloidal graphite, and describes scores of specific applications. Also lists the 19 principal properties of the material, and interprets them.

JMLCo A-A2

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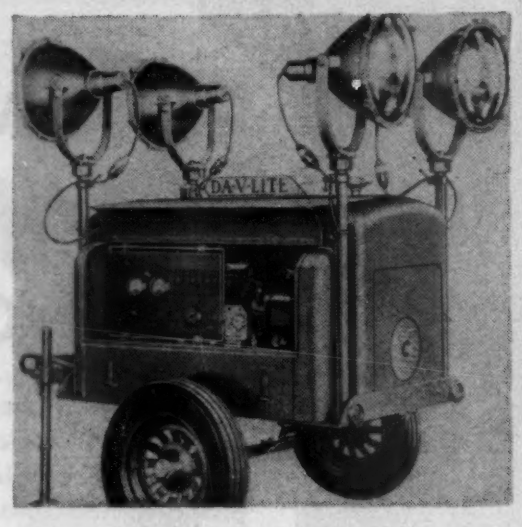
Our present oil supplier is
A-6

speed ranges may cover between 1 and 50,000 r.p.m. full scale. Metron Instrument Co., 432 Lincoln St., Denver 9.

LIGHTING AND POWER TRUCK

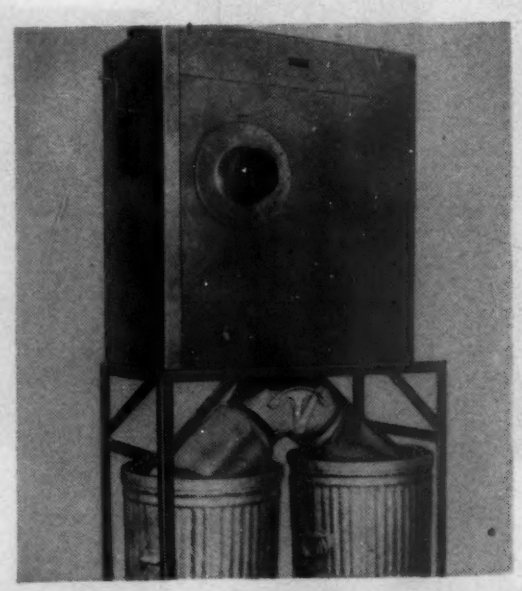
Designed to provide light and power where and when needed, the Da-V-Lite portable lighting and power truck is built around a 5000-watt Westinghouse self-excited, self-regulated a.c. generator. The four standard models are flood-



light, searchlight, combination, and beacon. All are available in skid and 2-wheel spring trailer mountings. Davey Compressor Co., Kent, Ohio.

DUST COLLECTOR

Self-contained recirculating type dust collector has storage and suction capacity for heavy-duty woodworking operations. Designated Model 11w50 Dustkop, it consists of a motor-driven suction and cleaning unit, a stand for supporting it, and two dust-collecting roller cans. An airtight canvas sleeve



fastened to an expanding gasketed sealing ring connects the cans with the discharge end of the cyclone separator. Aget-Detroit Co., Ann Arbor, Mich.

HOIST POWER CABLE REEL

Type "YS" Reelite, for use with hoists traveling distances up to 90 feet, automatically takes up and pays out con-

REZNOR
THE AUTOMATIC GAS HEATER with the . .
big quiet fan

You have trouble-free heating, where and when you want it and at less expense with handsome Reznor Gas Fired Unit Heaters . . . located at ceiling height or floor level. Automatic controlled Reznor units answer difficult heating problems in thousands of factories, offices, stores, warehouses, and homes . . . in large and small areas. Write for further data on comfortable, clean, economical Reznor units.

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SUSPENDED OR FLOOR MODEL

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GAS HEATERS SINCE 1888
NO BOILERS · NO STEAM LINES
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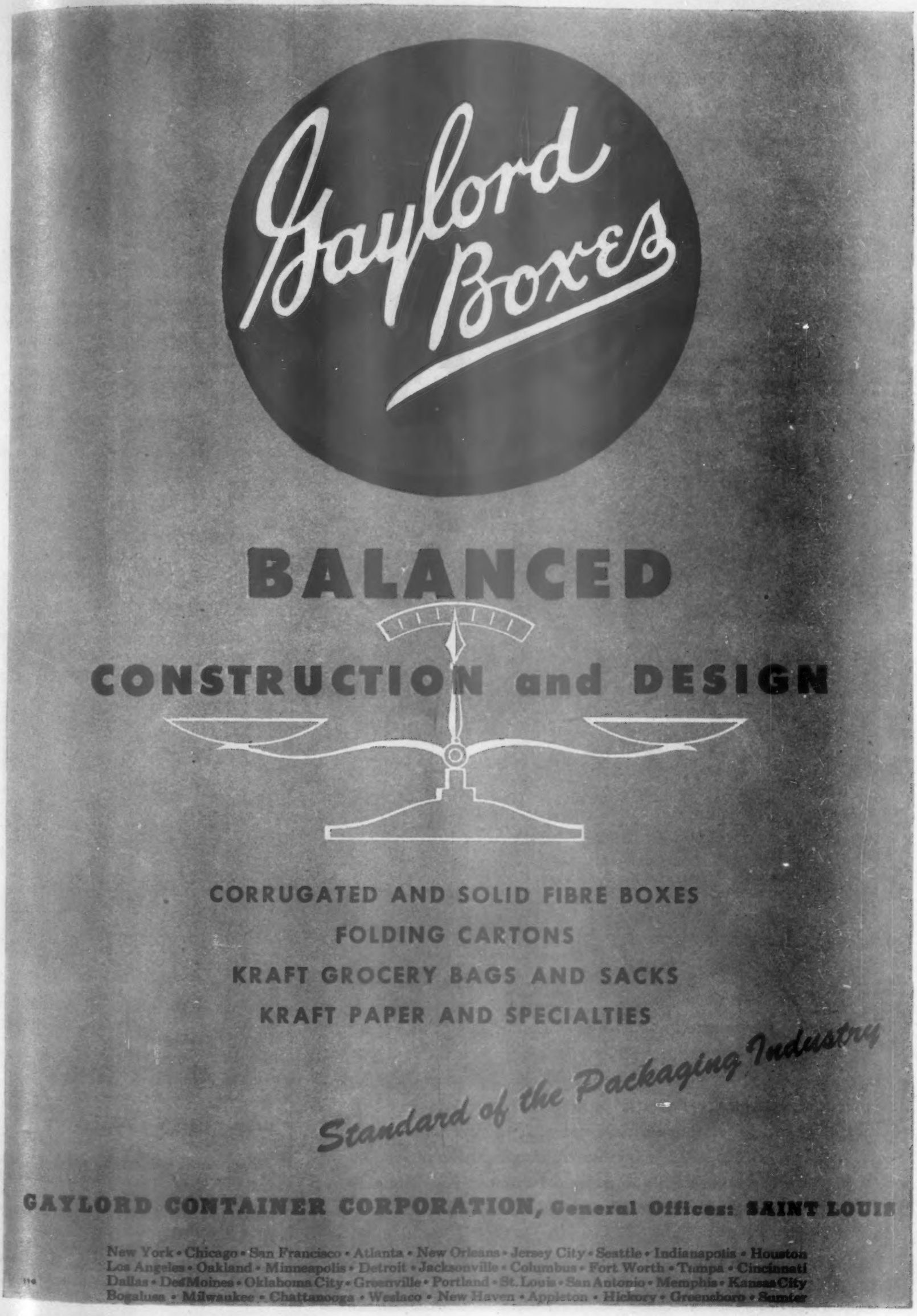
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BALANCED
CONSTRUCTION and DESIGN
CORRUGATED AND SOLID FIBRE BOXES
FOLDING CARTONS
KRAFT GROCERY BAGS AND SACKS
KRAFT PAPER AND SPECIALTIES
Standard of the Packaging Industry
GAYLORD CONTAINER CORPORATION, General Offices: SAINT LOUIS
New York • Chicago • San Francisco • Atlanta • New Orleans • Jersey City • Seattle • Indianapolis • Houston
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When it's Too HOT...Too HEAVY

Too SLOW by Hand

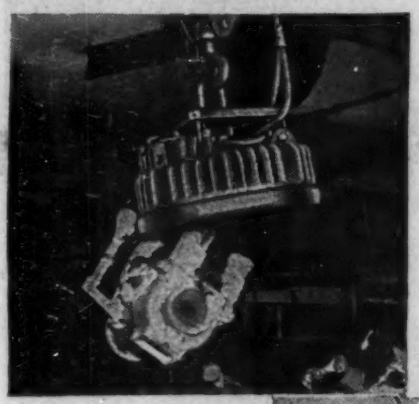
an EC&M Magnet

gives a LIFT wherever needed

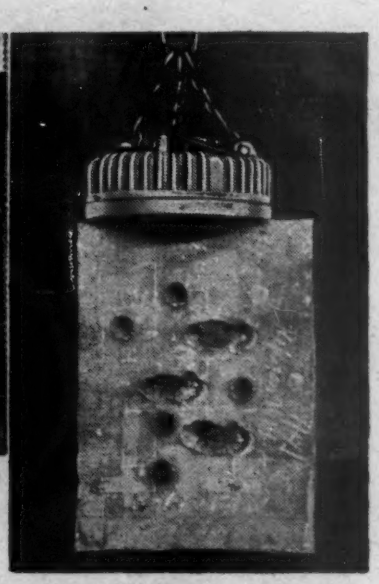
10 CIRCULAR SIZES • A MAGNET FOR *EVERY* CRANE

29-inch diameter Magnet receives 36-volt power directly from crane-truck.

Handling hot casting as soon as edges cool to become magnetic.



25-inch Magnet lifts heavy die-blanks on and off surface grinder.

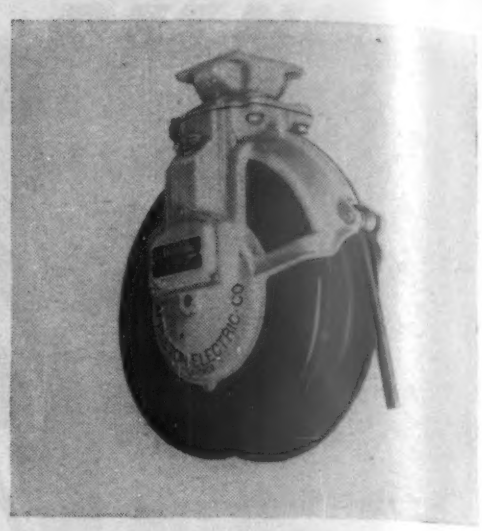


29R size lifts 1200-lb. pierced armour plate on edge.

THESE are small magnets of 29-inch diameter and less, which are designed to do the odd jobs throughout industry. They handle hot castings from the shake-out floor and lift heavy material from floor to machine. Because of their low cost and medium weight, they can be effectively used on industrial crane-trucks to reach into corners, between machines, through narrow aisles—to cover the territory inaccessible to overhead cranes. New Bulletin 904 describes and illustrates these magnets at work. Write for your copy.

THE ELECTRIC CONTROLLER & MFG. CO.

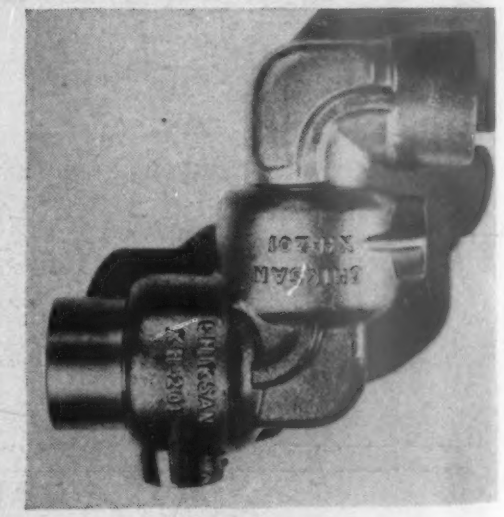
2698 EAST 79th STREET • CLEVELAND 4, OHIO



ductor cable. Has no exposed current collectors, trolleys, or wires. Serves any stretch of track—straight, or with one or more bends—up to double its cable length. For curved track, and certain straight track installations, the reel is furnished with swivel base permitting rotation up to 335 degrees. Safety grounding through an extra conductor prevents electrical mishaps. Appleton Electric Co., 1701-59 Wellington Ave., Chicago 13.

SWIVEL JOINT

Type XH swivel joint for working pressures of 12,000 p.s.i. has forged steel rotating members with flame-hardened ball races. Full 360-deg. rotation with low torque takes place on two rows of steel balls. The packing element, designed for high-pressure service, is self-



adjusting. The joint employs no bolted flanges, locking rings, or stuffing boxes. High pressure lubricating fittings provide for positive lubrication of the bearings. Chiksan Co., Brea, Calif.

FIRE ALARM SYSTEM

Self-contained alarm system, consisting of a simple thermostatic switch powered by four dry-cell batteries, signals when there is a sharp increase in temperature. As a fire alarm, it is set at 130 deg. F., and wired directly to a bell in the area where it may be required, or to any additional points desired. Turner Bros., Inc., 2625 Hilton, Ferndale 20, Mich.

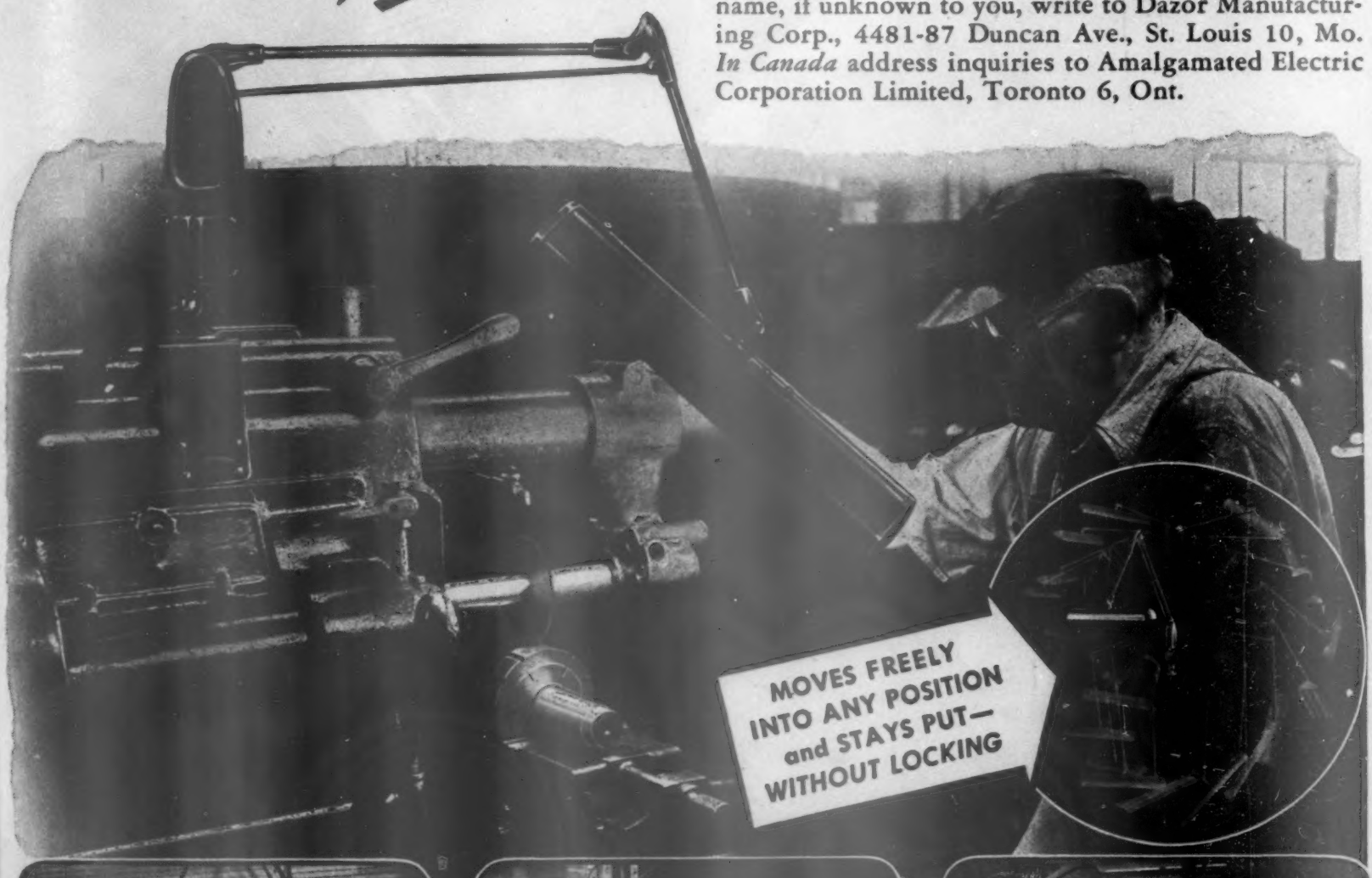
Personalized Lighting ... Instantly! DAZOR ALONE *Floats!*

CONCENTRATED light exactly ***where*** and ***when*** you want it! Light of the right ***quality*** and ***quantity,*** positioned so you can see the details of fine work quickly, with comfort and ease! Such are the advantages of Dazor, the ***floating*** lamp.

With your finger tips you simply float Dazor into the position desired. Lift your hand and the light *stays put* . . . automatically. A patented balancing mechanism makes further adjustment unnecessary. Dazor alone *floats.*

Provide personalized Dazor lighting for every task in your plant or office which requires precise, accurate seeing. Increase the efficiency and productivity of your workers, reduce accidents and waste.

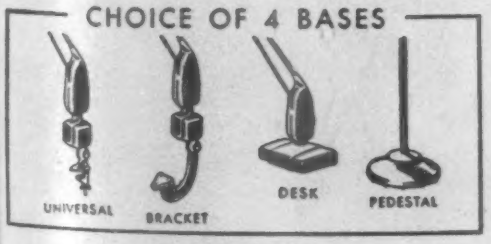
Phone YOUR DAZOR DISTRIBUTOR . . . let him demonstrate Dazor seeing benefits. For your distributor's name, if unknown to you, write to Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ont.



No squinting or nervous muscular tension here—the work area is brilliantly Dazor-lighted.

With "personally-fitted" Dazor lighting, this diamond setter adds the finishing touches to a ring mounting.

Instantly adaptable to the seeing conditions required, Dazor lighting permits speedier treatment of first aid cases.



DAZOR *Floating* LAMPS

FLUORESCENT *and* INCANDESCENT

Get the drop

on voltage drop

with BullDog Lo-X BUStribution DUCT

VOLTAGE drop can be figured—and so can temperature rise—even before your feeder system is installed.

The answer to these critical power distribution problems lies in BullDog Ventilated Lo-X BUStribution DUCT. And what do these problems mean to you? Just this:

1 Underpowered equipment can't operate at peak efficiency. At ten percent under voltage, for example, induction motors have *nineteen percent* less maximum running torque. And incandescent lights yield *thirty percent* less illumination!

2 High temperatures shorten the life of your distribution system and needlessly increase electrical costs.

What to do about it:

Be sure that your operating voltages and temperatures are curbed to insure peak performance by specifying BullDog Ventilated Lo-X BUStribution DUCT. Unique, superior design holds voltage drop and temperature rise to a minimum. Prefabrication makes it possible to determine both factors in advance.

Reach for your telephone and call a BullDog Field Engineer who can give you full technical information and show you a BullDog installation near your own plant. Or, write BullDog direct for descriptive literature.

• • •

BullDog also manufactures SafToFuse Panelboards—Switchboards—Circuit Master Breakers—Vacu-Break Safety Switches—Universal Trol-E-Duct for flexible lighting—Industrial Trol-E-Duct for Portable Tools, Cranes and Hoists—"Plug-in" Type BUStribution DUCT.

ADEQUATE WIRING SERVES AND SAVES

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ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN. FIELD OFFICES IN ALL PRINCIPAL CITIES IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO.

CHECK LIST for RUST PROTECTION

Photo courtesy International Harvester Company

- **PRODUCT . . . NOX-RUST 133** Inter-Plant Rust Preventive
- **TYPE . . .** Solvent (Cold Application)
- **FILM . . .** Thin, dry, waxy, dust-free
- **COVERAGE . . .** Economical: 800 sq. ft. gal.
- **APPLICATION . . .** Easy: dip, spray or brush
- **REMOVAL . . .** Quick: any petroleum solvent
- **PROTECTION . . .** Excellent for high humidity and corrosive industrial atmospheres
- **RECOMMENDED** for inter-plant shipment and storage of metal assemblies and parts-in-process; shed storage of completed units
- **WHERE USED . . .** Automotive, farm implement and other metalworking plants . . . production and assembly lines . . . tool rooms and cribs
- **USED ON . . .** Pistons, valves, crankshafts, all sorts of machined parts . . . tools, dies, molds . . . durable goods assemblies . . . tractors, farm machinery and other completed units in transit
- **FEATURES . . .** Room temperature application . . . simple to remove . . . dry, dust free, safe to handle . . . high humidity resistance . . . complete rust protection

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Send me by return mail prices on NOX-RUST 133

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you want to know

more about the items on this page

Letters to the addresses given will bring you further information.

COATING SOLUTION and primer coat that protect electro-plating and pickling racks. Have good resistance to cleaners. The B. F. Goodrich Co., Akron.

ULTRA-VIOLET RAYS SCREENED by Plexiglas Special UVA. Material is said to have excellent optical properties and permit full vision without danger of sunburn. Rohm & Haas Company, Philadelphia.

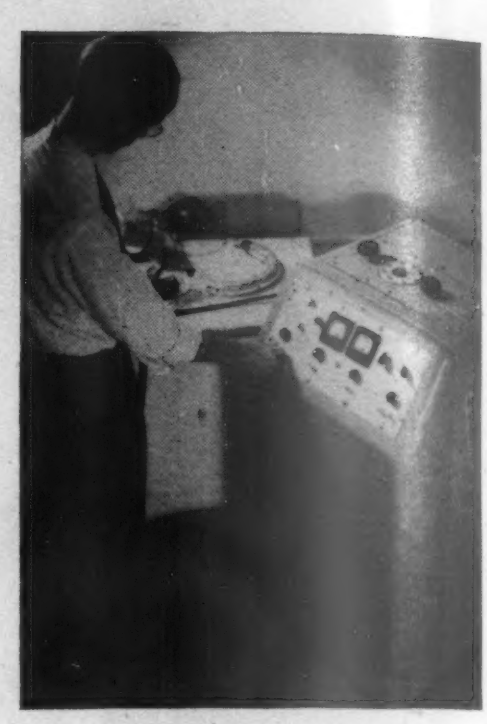
WALKWAY TESTER measures surface resistance of wood, linoleum, leather, and related materials. Tinius Olsen Testing Machine Co., North 12 St., Philadelphia 23.

RUBBER INSULATING MATERIAL that is lighter than cork, will not absorb moisture, and resists fire, rot, acids, oil, vermin. United States Rubber Co., Rockefeller Center, New York.

PERSPECTIVE DRAWINGS made with high-precision perspective drawing instrument. Stereoscopic pairs may be produced. Pomeroy Stereograph Co., Inc., 1783 East 11th St., Cleveland 14.

APPRENTICE TRAINING in plumbing, steamfitting, other pipe trades. Described in reprint, "Here's How It's Done In Atlanta." Methods, wages, and joint apprenticeship committee are subjects discussed. Copies free from Apprentice-Training Service, U. S. Dept. of Labor, Washington 25.

MECHANICAL WASHER, claimed to clean, polish, dry automobiles, panel delivery trucks at the rate of one a minute. Minit-Man Car Washer Div., 7450 Melville St., Detroit.



VACUUM LEAK DETECTOR finds and measures leaks in vacuum and pressure systems. The instrument is said to be extremely sensitive and its design is based on Mass Spectrometer principle. Consolidated Engineering Corp., 620 North Lake Ave., Pasadena 4

PICKLING ALUMINUM—a new safe process is described in a technical bulletin that reports use of Troxide-E to produce bright clean surfaces for aluminum and alloys. Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6.

COMBATING FLASH STRIKES. Techniques are described in a bulletin that defines this type of strike and cites

HOW TO POUR BEARINGS is told by an instruction card illustrated with six cartoon-type pictures, two of which are shown here. Card is suitable for hanging in shop. Copies are available through offices and branches of Joseph T. Ryerson & Son, Inc., Chicago

IF ALL YOUR ALUMINUM CASTINGS AREN'T *Blue Ribbon Babies*

The Alcoa Service Engineer can make suggestions and recommendations that will help you cut down rejects, and get more ready-to-ship castings out of your aluminum ingot inventory.

He may suggest minor pattern changes or a different Alcoa Casting Alloy. Or a change in the spotting of gates and risers. Perhaps your melting procedure or foundry techniques can be improved. Aluminum foundry procedure is his business; his advice can help you make your Alcoa Pig and Ingot go further, with fewer rejects and casting repairs.

If you need information or technical help on aluminum casting practices, write to ALUMINUM COMPANY OF AMERICA, 2126 Gulf Bldg., Pittsburgh 19, Penna. Or call the Alcoa sales office nearest you.

MORE people want MORE aluminum for MORE uses than ever

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

MOVE MATERIALS with FEWER MEN

This illustration shows a typical application of DRACCO Pneumatic Conveyors, with ONE man and the DRACCO Pneumatic Conveyor doing the work of SEVERAL men. In many industries, DRACCO is handling chemicals, grains and granular materials more efficiently, and at less cost . . . with fewer man hours. Why not let DRACCO Engineers check your present material handling methods. They have had over 30 years of experience in material handling.

For Further Information Write

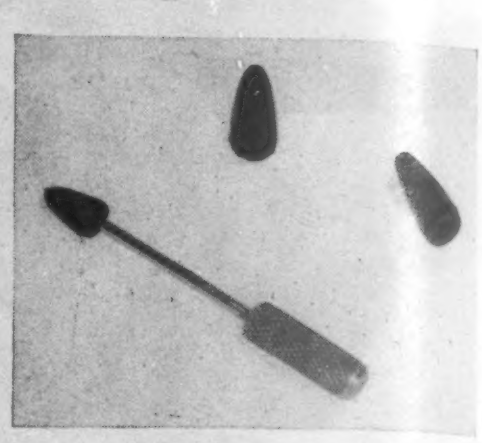
DRACCO CORPORATION

4091 E. 116th St., Cleveland 5, Ohio *New York Office: 130 W. 42nd St.*

DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

legal action in different cases. Law Department, National Association of Manufacturers, Investment Bldg., Washington, D. C.

DRAFTING PENCIL, with four-jaw collet grip, balanced aluminum body, no moving mechanical parts, offered by Nord Products, East Orange, N. J.



POINT PROTECTOR, made of rubber, shields sharp and delicate points of tools and instruments. Employee injuries and clothing damage are prevented. Granger Mfg. Co., 314 Sherbourn Drive, Los Angeles 36

FOOD COST CONTROL—operation tips for industrial plant cafeterias, information on food supply, menus, given in "Serving Many." Production and Marketing Administration, U. S. Dept. of Agriculture, Washington, D. C.

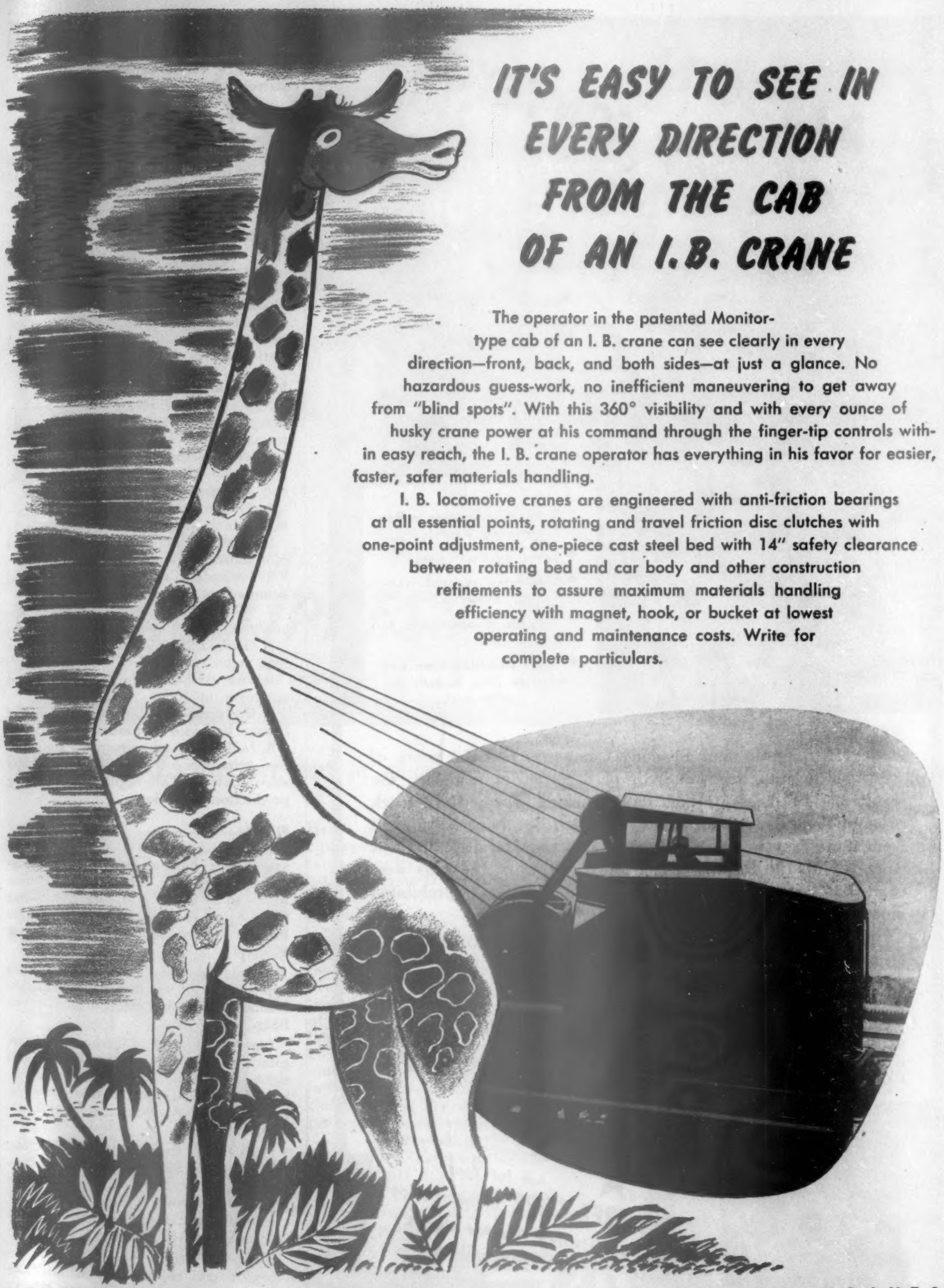
PREFAB ALL-ALUMINUM HOUSES, 4-room size, are claimed to be permanent. They are attractive and can be erected quickly—possibly the type of house that a company might set up for its workers. Price $899.75 f.o.b., Birmingham. Southern States Iron Roofing Co.

PRESSURE PHENOMENA ANALYZED in hydraulic systems with portable high speed electronic analyzer. Operation of the instrument is said to be simple. Aeroquip Corp., Jackson, Mich.

ELECTRODES RENEWED automatically with electric salt bath furnace that uses action of oxides to counteract erosion. Upton Electric Furnace Div., 7450 Melville St., Detroit.

MIDGET-SIZED FURNACE that operates on commercial types of gas, uses sealed-flame heating principle, is claimed to have unique installation and service features, and is designed for zoned heating. Stewart-Warner Corp., Indianapolis.

DIE STEEL, suitable for plastic molds and



IT'S EASY TO SEE IN EVERY DIRECTION FROM THE CAB OF AN I.B. CRANE

The operator in the patented Monitor-type cab of an I. B. crane can see clearly in every direction—front, back, and both sides—at just a glance. No hazardous guess-work, no inefficient maneuvering to get away from "blind spots". With this 360° visibility and with every ounce of husky crane power at his command through the finger-tip controls within easy reach, the I. B. crane operator has everything in his favor for easier, faster, safer materials handling.

I. B. locomotive cranes are engineered with anti-friction bearings at all essential points, rotating and travel friction disc clutches with one-point adjustment, one-piece cast steel bed with 14" safety clearance between rotating bed and car body and other construction refinements to assure maximum materials handling efficiency with magnet, hook, or bucket at lowest operating and maintenance costs. Write for complete particulars.

INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES

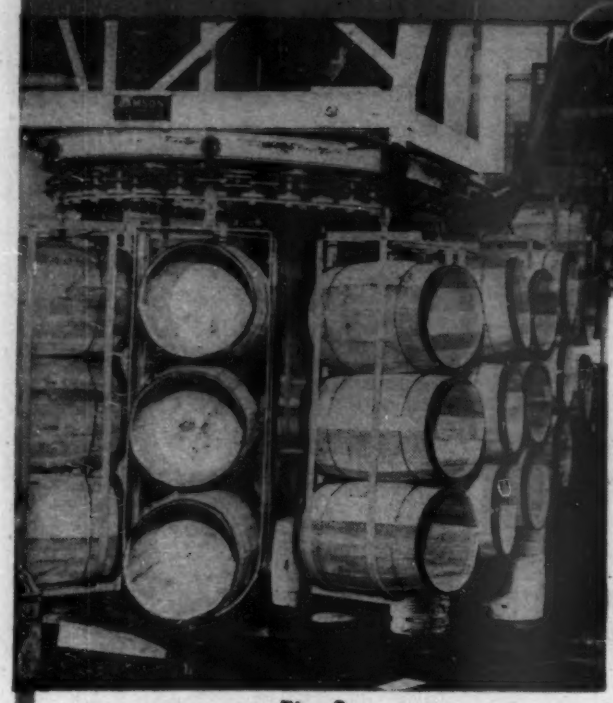
INDUSTRIAL BROWNHOIST CORP • BAY CITY, MICH • District Offices: New York, Philadelphia, Cleveland, Chicago • Agencies: Detroit, Birmingham, Houston, Denver, Los Angeles, San Francisco, Seattle, Vancouver, B.C., Winnipeg, Canadian Brownhoist Ltd., Montreal, Quebec.

LAMSON OVERHEAD CONVEYOR

PROVIDES

FLOATING STORAGE

For 550 Kegs Between Receiving Room and Packing Department



- Relieves congestion in Receiving Room!
- Saves packers' time!
- Eliminates manual handling!
- Reduces 4 operations to 2!
- Saves Handling time and productive time in both departments!

Fig. 2

THE Lamson and Sessions Company, manufacturers of bolts, nuts, and hundreds of other metal fasteners, use about 550 12" kegs for each day's packing. Formerly, a truck brought them daily to an already crowded Receiving Room, and from there they were sent, 35 or 40 at a time, on a cleated belt conveyor, to the Packing Department. Upstairs, the kegs were carried 35 feet to the point of use. Lack of floor space prohibited more kegs being stored.

In conjunction with Lamson and Sessions engineers, LAMSON devised this Floating Storage on an Overhead Conveyor. Now the truckman unloads the kegs directly onto the conveyor (Fig. 1). They are carried up one flight, and across a balcony to an adjoining building, where they dip to a convenient height for the packers' use (Fig. 2). The system holds the daily requirement—550 kegs. No more congestion! No manual handling! 4 operations are cut to 2! No time is lost waiting for kegs when needed! Packers waste no time carrying kegs! This is a typical example of industrial saving and increased efficiency through LAMSON Mechanization.

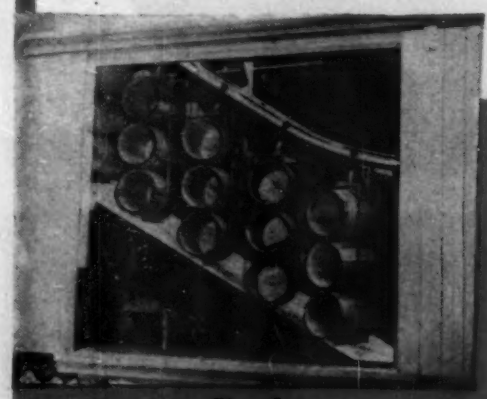


Fig. 1

Ask for Your FREE COPY of the new book "Utilize The Air Rights of Your Ceiling"

LAMSON CORPORATION

[illegible] St., Syracuse 1, N. Y.

for die casting dies for white metal alloys. It machines at 300 Brinell and permits hardening the steel before machining. Vanadium-Alloys Steel Co., Latrobe, Pa.

EMPLOYEE SECURITY described in public relations booklet, "Steps to Security." Cartoons and facts sum up benefits given the present-day employee. Standard Oil Co., Room 1626, Rockefeller Plaza, New York 20.

AUTOMATIC ELECTRODE and adaptor that combines all materials necessary for producing a crucible-enclosed welding arc. Mechanical grid construction binds heavy flux coating to wire core and allows continuous feed from a reel into mechanically maintained arc. National Cylinder Gas Co., Chicago.

SLIDEFILMS, SOUND:

Supervisory Development Program, designed as a visual-discussion course, trains foremen and supervisors in management techniques. The course is offered by Vocafilm C[illegible]p., New York, and it consists of thes[illegible]ight topics:

1. *Freedom of Opportunity*—elementary principles of business economics.
2. *Effective Management* — principles of organization and management.
3. *Individual Output*—concludes and summarizes topics 1 and 2.
4. *When You've Got a Problem*—analysis of plant operation problems.
5. *Getting Ideas Across*—how to motivate employees.
6. *The Will to Produce*—analysis of employee attitudes.
7. *Understanding People*—analysis of human behavior in industry.
8. *Individual Adjustment* — summarizes principles of preceding topics and shows how they are applied in removing production obstacles.

FILMS:

An American Miracle, two reels, sound, gives basic steps in setting up balanced production for 3-in. projectiles. Released by General Motors. Rental free from Association Films, YMCA Motion Picture Bureau, 347 Madison Ave., New York 17.

Hello Business! sound, color, presents applications of telephone recording in business. Dictaphone Corp., Graybar Bldg., New York.

Light Is What You Make It, 16 mm, color, sound, deals with principles of sight and uses of artificial lighting. Issued by Edison Electric Institute. Distribution through local electrical utility companies.

Partners in Production, sound, color, tells message that management is trying to give workers in manufacturing plants throughout the country. Prints are available through agents of Aetna Life Affiliated Companies.

Threaded Products for Western Industry, sound, color, shows manufacturing of threaded bolts and cap screws, including processes and tool and die making. Cooper Screw Mfg. Co. of Los Angeles.

Work Simplification...

MULTIPRESS has key part in all-out work-simplification program at LIONEL Corporation

Here's a close-up of a MULTIPRESS, equipped with a HydrOILic index table, doing its part in a work-simplification program at the Lionel Corporation that lowered costs and *doubled* production.

The MULTIPRESS rivets coupler coils to the "trucks" of the famous Lionel toy trains. Trucks are fed to each MULTIPRESS operator on the "train-track" chutes coming in from the right of the picture. Working with both hands, the operator simply fits a coupler coil from a nearby bin to each truck, loads the assemblies onto the index stations—and MULTIPRESS does the riveting at the rate of a thousand per hour! A sweep arm and air jet whisk the riveted pieces off the index table onto the conveyor belt.

The quiet, oil-smooth accuracy of MULTIPRESS power is a "natural" for dozens of different operations—in any kind of production. And you can see in this instance how the streamlined compactness of this powerful little bench-size tool is an important advantage. The unit fits close to the conveyor belt, permits parts-supplying chutes of minimum length, and affords maximum room for conveyor equipment as well as for the operator.

MULTIPRESS is available in 4, 6, and 8-ton capacities, in both manually and automatically controlled models offering ram actions for every type of requirement. The HydrOILic Index Table is only one of a wide variety of standard attachments and tooling accessories that adapt the basic MULTIPRESS to many different needs. Write for data suggesting how this *new kind* of oil-hydraulic production tool can help you!

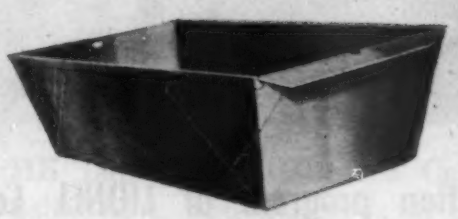
The Denison Engineering Company, 1154 Dublin Rd., Columbus 16, Ohio.

DENISON
EQUIPMENT *in* APPLIED
HydrOILics

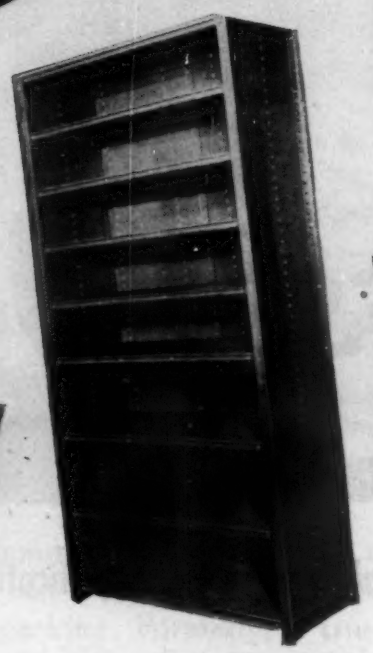
YOU FURNISH THE STEEL

Lockers

Kitchen Cabinets

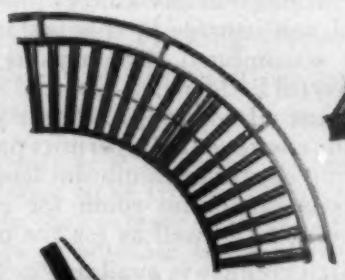


Shop Boxes

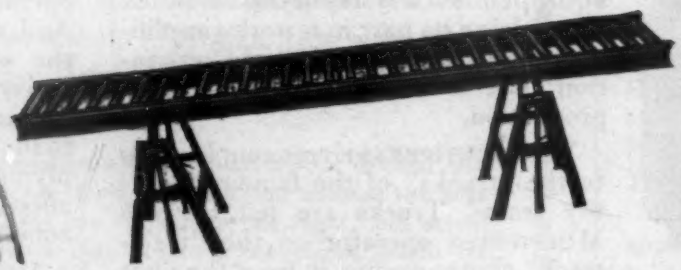


Adjustable Shelving

Benches



Gravity Conveyors



Filing Cabinets

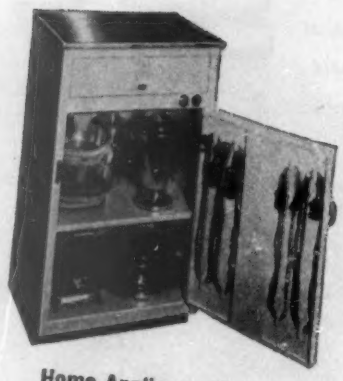
STANDARD LYON PRODUCTS

Steel producers haven't been able to provide us with enough steel to make full use of our facilities. These facilities, and ample skilled manpower to operate them, can be utilized for quick production of a wide range of products. Here are two ways Lyon has helped other companies . . . and can help you if you have steel on hand, or available:

LYON METAL PRODUCTS, INCORPORATED

LYON will make the product

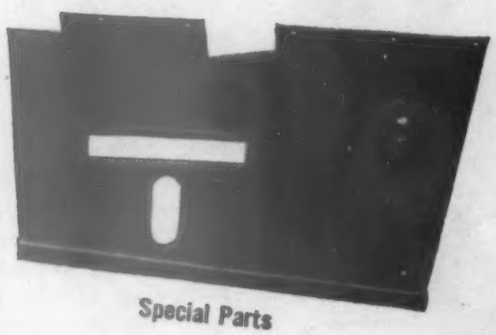
Electrical Control Units



Home Appliance Stands

Water Cooler Containers

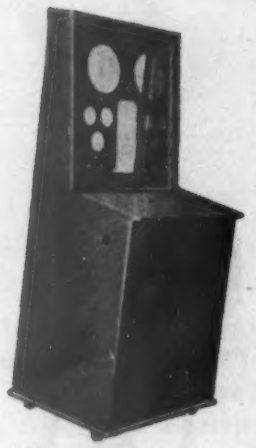
Storage Battery Racks



Special Parts

CONTRACT PRODUCTION OF SHEET STEEL ITEMS GAUGES FROM 8 TO 30

Office Equipment Stands



Testing Cabinets

1 STANDARD LYON PRODUCTS

To complete your plant expansion or conversion program, we will accept your sheet steel (12 to 24 gauge and certain sizes of band steel) and supply you pound for pound with any selection of "Lyon Standard Products" currently in production, a few of which are: Steel Shelving, Lockers, Shop Equipment, Kitchen Cabinets, Filing Cabinets, and Gravity Conveyors.

2 SPECIALIZED CONTRACT PRODUCTION

We will manufacture to your specifications: assemblies, sub-assemblies or parts, in gauges No. 8 and lighter up to No. 30; in Lyon production run quantities.

Get in touch with your Lyon Dealer . . . or your closest District Office

General Offices: 189 Monroe Avenue, Aurora, Illinois • Branches and Dealers in all Principal Cities

QUALITY *Tips the* SCALES

The M-P 2400 Series Centrifugal Pumps have an enviable record of dependable world-wide performance, pumping out water continuously in volumes previously thought impossible for pumps of comparable size and cost.

Weight: 9 lbs.

This compact little pump is available in two models:

2400B All Bronze $25.00.

2400C Cast Iron (Bronze Impeller) $21.50.

MODEL 3100: bronze; reversible; 150 GPM.

FLOMASTER 10: portable engine; self-priming GPH 10,000.

MODEL 3610: bronze; clutch integral; C.W. or C.C.W. rotation; 130 GPM.

Easily installed, tapped for priming connection, with an intake of 1¼", discharge of 1", the M-P 2400 Series Pump employs original and unique construction on the pumping side since both the permanent and dependable sealed construction and double row bearing-shaft assembly are built for long service without the necessity of lubrication or adjustment.

Industrial MP Marine
ENGINEERED EQUIPMENT
MARINE PRODUCTS COMPANY
815, LYCASTE AVENUE • DETROIT 14, MICHIGAN

SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Lecturer in Government Regulations, New York University, and a Member of the New York Bar

Period Surveyed: November 1 to December 1

TREND INDICATORS

Veterans' Rights

VETERAN RIGHTS PROTECTED IN CONTRACTS

A recent survey of 133 contracts by the Bureau of Labor Statistics indicates that 93 per cent contain clauses protecting the job rights of veterans, 30 per cent give temporary employees the rights guaranteed regular veteran employees, and 9 per cent provide special seniority rights to veterans who have never previously been employed. Among the contracts providing for greater rights than those granted in the statute are: (1) Provision that the veteran be restored to that position he would have held, had he not entered the armed forces; (2) provision that the returned veteran be promoted above his former job; (3) provision for preferential seniority credit to veterans who had served overseas; (4) provision for the same rights for temporary employees as received by permanent employees. The following clause is illustrative of the type that covers veterans who were not employees:

"*Non-Employee Veterans*: Any veteran of the present war (1) who was not employed by any person or company for a period of ninety (90) days or more immediately preceding his entry into voluntary service, or (2) who, although employed elsewhere than by the employer within the above specified period, has acquired physical handicaps in military service, is hired by the employer herein after he is relieved from military service, and not dishonorably discharged, shall, upon having been employed for the probationary period provided for all new employees in this contract, receive seniority credit for the period of such military service subsequent to May 1, 1940; provided, however, (a) such non-employee veteran shall have been hired within ninety (90) days from the time he is relieved from military service, or, if such veteran is unable to work by reason of physical disability during said period of ninety (90) days, from the time his disability shall have ended; and (b) such non-employee veteran shall not be employed for the purpose of bringing about the displacement of another employee."

REINSTATEMENT ORDERED DESPITE HARDSHIP TO OTHERS

A federal district court ordered the reinstatement of a returned veteran to his same former job despite the fact that such reinstatement disrupted the company's operations and violated the seniority provisions of the contract.

The veteran, before induction, had been employed as a bus driver. After honorable discharge from the armed forces, the veteran sought reinstatement on the 89th day of the statutory 90-day period. He insisted that he be given the choice of run he desired in keeping with his seniority. The contract between the union and employer provided for reassignment of such runs four times a year, the assignments depending upon the choices of workers in the order of their seniority. The veteran's application for reinstatement was made shortly after runs had been reassigned, but he opposed the employer's request that he wait till the next assignment date.

The court, fearing a contrary decision would abridge veterans' statutory rights in subsequent cases, awarded the veteran his full demands—i. e., reinstatement to his former job with immediate choice of run, and back pay for idle time. Moreover, the court declared the veteran was under no obligation to accept any reasonable offer made by his employer for the interim period so as to mitigate damages. Even though the court conceded that the veteran's conduct was unfair, it did not feel that selfish employers should be given an opportunity to take advantage of veterans "who are deserving of every consideration." (Feore v. North Shore Bus Company, USDC E. N. Y.)

VETERAN ENTITLED TO COMPANY-WIDE REINSTATEMENT

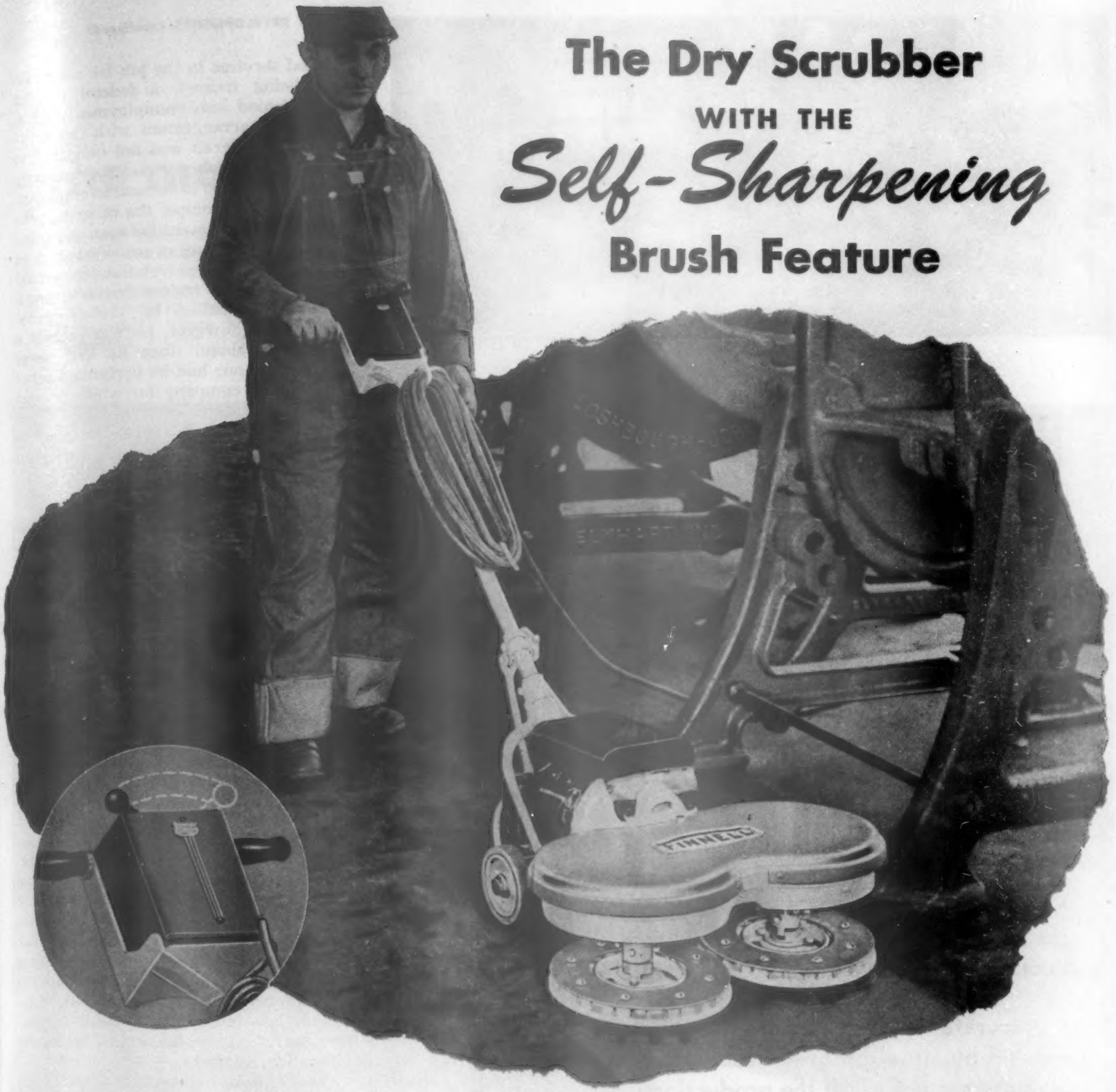
The Department of Justice recently issued its view on the subject of "like seniority" under the Draft Act. The Department takes the position that a veteran is actually an employee of a company and not of any particular plant, and therefore has all the seniority rights of any employee of the company from the date of his original employment.

Accordingly, if the plant in which a veteran was employed before induction into the armed forces has been abolished, the employer should reinstate him "anywhere that he can be placed in a job of like status and pay, plus his accrued seniority from the date he was first employed."

TRAINEE NOT ENTITLED TO REINSTATEMENT

Where the veteran had completed his training for a job with the company before his induction, but had never per-

The Dry Scrubber WITH THE *Self-Sharpening* Brush Feature



Just Flip the Switch That reverses the motion of the brushes of the *Finnell* Dry Scrubber and re-sharpens them automatically! Eliminates the need for frequent changing of brushes by hand in order to maintain a good cutting edge. Automatic reversal of the brushes also helps keep them functioning efficiently by ejecting sticky substances that may otherwise tend to clog.

This heavy duty *Finnell* cleans grease-caked floors in about *one-tenth* the man-hour time required when hand-spudding, and is far more thorough. Floating brush rings enable the two powerful scarifying brushes to get into indentations and grooves that rigid coupling brushes pass over and miss. And the low construction makes it easy to clean around and beneath equipment. The machine is adaptable to wet scrubbing, steel-wooling, waxing, and polishing. Ruggedly constructed, assuring long, trouble-free service. Has heavy duty G. E. Motor, oversize Timken Roller Bearings, special bronze worm gears—a quality product throughout, reflecting *Finnell's* four decades of specialized experience in the manufacture of floor-maintenance equipment.

For free floor survey, consultation, or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2501 East St., Elkhart, Ind. Canadian Office: Ottawa, Ont.

FINNELL SYSTEM, INC.

Pioneers and Specialists in

FLOOR-MAINTENANCE EQUIPMENT AND SUPPLIES

BRANCHES IN ALL PRINCIPAL CITIES

Having Shortage Troubles?
McCaskey Can Help You!

Do the parts that are most easily made get the break in your plant? Whether the answer is yes or no, you can schedule the jobs in all of your departments so definitely that shortage delays will be avoided through an extremely simple and flexible McCaskey Control.

You can also visualize their progress thru McCaskey without becoming lost in voluminous hidden records. Equally important, McCaskey "One-Writing" eliminates the excessive paper-work frequently associated with production control systems.

Accurate machine loading and scheduling, supplemented by visual progress records that give you an immediate picture of all the production in your plant, will also enable you to anticipate difficulties that may arise from material shortages. Instead of working under pressure from shortage lists, work according to a plan determined by your delivery requirements—thru McCaskey Control!

Write today for a copy of "One-form Dispatch Plan Keeps Work on the Move" and other material suggesting how McCaskey Control will help you. Or better still, let us have a representative outline a plan for your particular needs.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

formed services in the job for which he was being trained, a federal district court denied him reemployment rights. Under his arrangement with the company, the veteran was not obligated to become an employee and the company was not obligated to become an employer. Neither could compel the other to perform. The agreement between the company and the veteran provided that an employer-employee relationship would begin when the trainee began to work upon being called by the company. Until then, however, he was merely a qualified trainee, since he had never been called nor had he performed services for the company for which he was entitled to receive compensation. Since no employer-employee relationship had in fact existed, the veteran had no right to seek reinstatement as an employee. (Fields v. Southern Railway Company, USDC E. Tenn.)

REINSTATEMENT DENIED WHERE VETERAN WAS INDEPENDENT CONTRACTOR

A federal district court denied reinstatement rights to a returned veteran who was a commission salesman for a furniture company before his induction into the armed forces. In his previous work, the veteran (1) solicited orders for the company under an oral agreement; (2) was paid on a commission basis; (3) was free to solicit whenever and however he chose; (4) was not required to spend full time or any particular time in such work; (5) was not prohibited from selling other articles at the same time; (6) paid all his own expenses; (7) did not use the company's office as his headquarters; (8) worked under no sales quota; and (9) did not have social security or withholding tax deducted from his commissions. From these facts, the court concluded that the veteran had had an independent contractor relationship with the company, and therefore the latter was under no obligation, statutory or otherwise, to reinstate him. (Brown v. Sunbeam Furniture Company, USDC S. Calif.)

LIABILITY TO NON-VETERAN FOR LAYOFF UNDER "SUPERSENIORITY"

According to a recent arbitrator's decision, a company's application of the "superseniority" doctrine for two months before it was overruled by the circuit court of appeals, was held to be a violation of the seniority provisions of its contract with the union. The parties' contract provided: "During slack seasons peak force workers shall be laid off according to their seniority rights, the available work shall be distributed among the normal force, and peak force workers shall not be recalled until normal force workers are receiving full time work. Seniority rights shall apply during rehiring periods."

The company ordered, according to the regulations of Selective Service, that returned veterans be given superseniority when layoffs become necessary, which resulted in a large number of

Plymetl

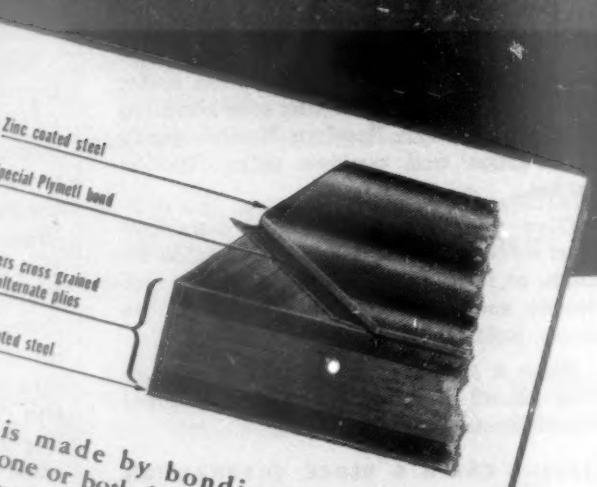
The material that's making news today

For over twenty-five years, Plymetl — a Haskelite material — has helped designers and engineers build greater performance, durability and sales appeal into their manufactured products. Its use eliminates deadweight, and makes complicated framing members and fastenings unnecessary. There is only one Plymetl . . . Haskelite Plymetl . . . with its performance proved. A material of many advantages, Haskelite Plymetl is easily worked with simple metalworking or woodworking tools. It can often save man-hours to a point where the final cost of the product may be noticeably reduced. The unique strength and weight characteristics of Plymetl are graphically described in the chart below. Write for complete data and samples of Plymetl.

	PLYMETL UVU			STEEL U.S. STD. GAUGES			ALUMINUM B & S STD. GAUGES		
	1/4"	5/16"	3/8"	20 ga.	16 ga.	12 ga.	10 ga.	8 ga.	6 ga.
Weight in lbs. per sq. ft.	1.01	1.17	1.43	1.5	2.5	4.37	1.44	1.81	2.28
Stiffness factor E I in. ^{2} lbs.	4,900	8,400	13,200	124	575	3,050	872	1,760	3,500

	PLYMETL EVE			STEEL U.S. STD. GAUGES			ALUMINUM B & S STD. GAUGES		
	1/4"	5/16"	3/8"	20 ga.	16 ga.	12 ga.	10 ga.	8 ga.	6 ga.
Weight in lbs. per sq. ft.	2.25	2.40	2.56	1.5	2.5	4.37	1.44	1.81	2.28
Stiffness factor E I in. ^{2} lbs.	17,000	28,000	43,000	124	575	3,050	872	1,760	3,500

In computing the values of Plymetl, the following is assumed: (1) The modulus of elasticity of steel, 30,000,000 lbs. per sq. in. (2) The modulus of elasticity of aluminum, 10,000,000 lbs. per sq. in. (3) The modulus of elasticity for the core material, 1,300,000 lbs. per sq. in. along the grain. 65,000 lbs. per sq. in. across the grain. (4) The thickness of steel and aluminum, .021" (27 ga.) and .015", respectively. (5) The weight of plywood plaque, 30 lbs. per cu. ft.



Plymetl is made by bonding thin sheets of metal to one or both faces of a plywood plaque. Its construction effects the most efficient distribution of these materials, combining high strength qualities of the metal surfaces with low density of woods. Result: Plymetl makes an ideal structural material, simulating an I beam with the metal surfaces taking the part of the flanges and the light weight plaque acting as the web.

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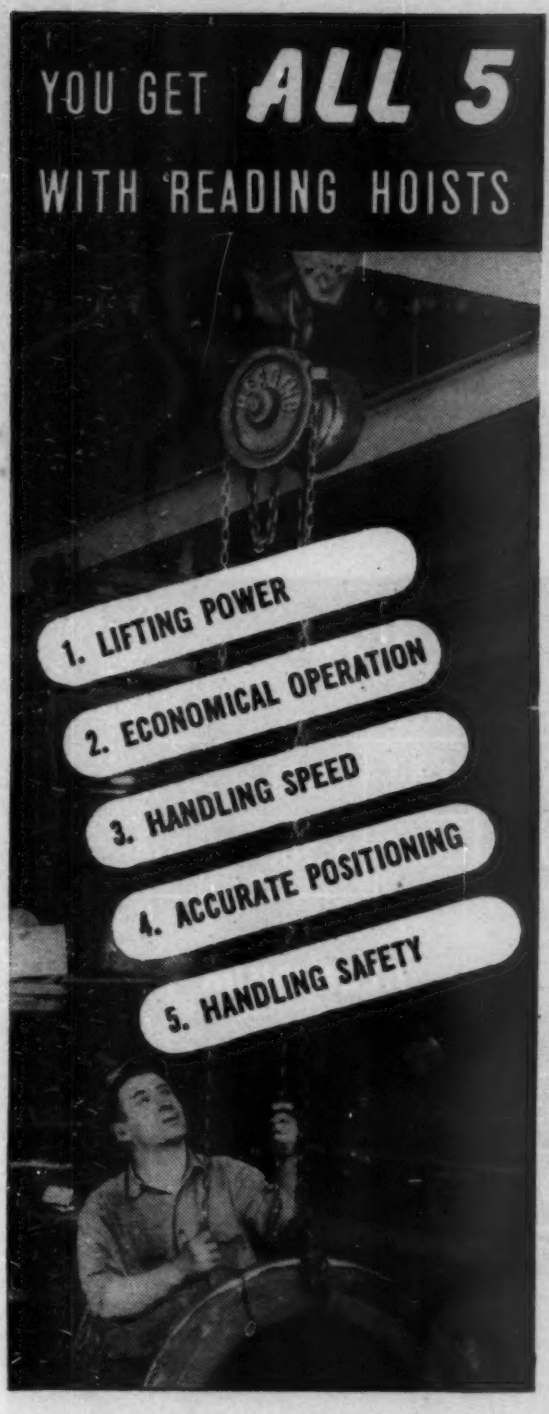

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non-veterans with greater seniority being laid off, while veterans were given the available work. The union did not contest this policy until one week before the rescission of the policy.

The company contended that it should not be penalized by having to pay wages to workers who were laid off, having paid the wages to veterans, since it acted in good faith in accordance with existing governmental regulations and the union did not protest at the time the rule was instituted.

The arbitrator pointed out that, in all instances, it has been held that an existing contract between the company and union is binding on the parties unless a specific law or lawfully authorized directive order invalidated the contract. This was not the case here, nor was any modification of the existing contract agreed upon between the parties. (In re arbitration between Arlington Mills and United Textile Workers of America)

Wage-Hour Regulations

VOLUNTEER WORK HELD COMPENSABLE

Where an individual offered to perform services for a company voluntarily without compensation, a federal district court held him entitled, nevertheless, to an amount as unpaid compensation and liquidated damages. The court declared that the individual was an employee within the meaning of the Wage-Hour Law since the employer suffered or permitted him to work. The fact that he previously protested against being paid for such services does not relieve the employer of his statutory obligation to pay the minimum wages prescribed by the Act. Moreover, the court set 65 cents an hour as a reasonable value of his services instead of the statutory rate of 40 cents an hour. (Rogers v. Schenkel, USDC W. N.Y.)

COUNSEL FEES IN WAGE-HOUR SUIT

On the ground that the issues of law involved were new, several briefs were submitted, the case was difficult to prepare, and that a large number of witnesses were questioned, a federal court awarded $7000 as attorney's fees in a Wage-Hour suit for back wages. Furthermore, an agreement between the attorney and his clients whereby the former was to receive one-third of the amount recovered does not, in the court's opinion, affect the employer. Nor does the Act prohibit an employer from paying his attorney more than the sum awarded by the court. (Skidmore v. John J. Casole, Inc. USDC S. N.Y.)

CONTRACTOR LIABLE FOR CHILD LABOR VIOLATION

Where the government entered into an oral order for packing boxes from a contractor on August 9, which were shipped August 11, but the contract was not signed until August 14, the Public Contracts Administrator held the contractor liable for child labor violations

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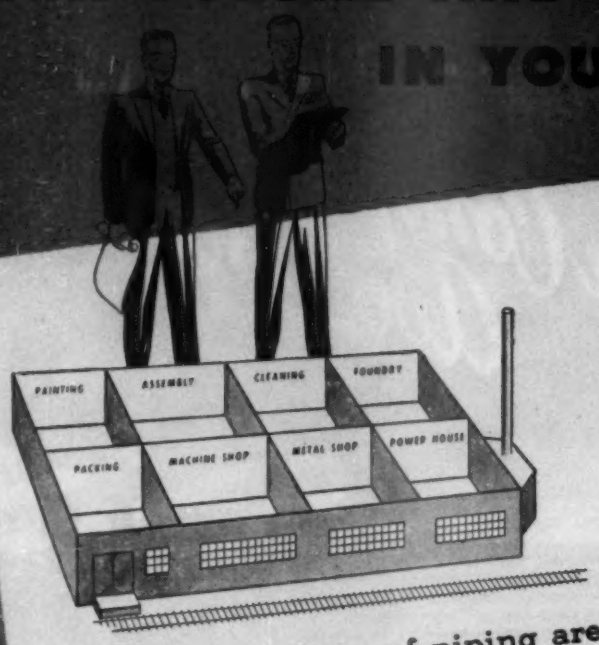
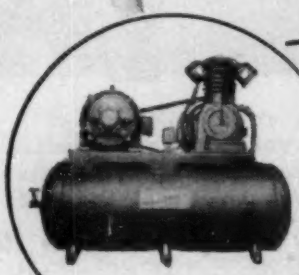


1. What lengths of piping are now servicing your plant?
2. What pressure are you losing through these trunk lines?
3. How many production hours would you lose if your compressor should break down?
4. How much in power costs are you paying to operate your present equipment?



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LABOR DEVELOPMENTS *(continued)*

from August 11. The contractor contended that his liability did not begin until August 14, but the administrator declared that the first shipment on August 11 constituted an acceptance of the government's oral offer. Accordingly, the contractor was fined $10 a day beginning on August 11 for each minor illegally employed. (Evergreen Mill Works Manufacturing Company, Inc., Public Contracts Administrator)

HELD NOT UNDER THE ACT

Guards and watchmen employed by an aviation company to guard the local airfield and the personnel and property contained thereon, despite the employees' contention that they were engaged in interstate commerce by virtue of the fact that students from various states were assigned to the field for training, airplanes engaged in government service were frequently serviced and repaired at the field, that goods received from other states were sold at the canteen on the field, and that planes from the field frequently crossed state lines. (Phillips v. Graham Aviation Company, CCA-5)

HELD EXEMPT

Workers employed as scowmen by a dredge and dock company to work on several types of scows and whose work was primarily an aid to the operation of the scows as a means of transportation, since they are "seamen." (Gaard v. Great Lakes Dredge & Dock Company, USDC N.. Ill.)

NATIONAL LABOR RELATIONS BOARD

*MANAGEMENT'S RIGHT TO SCHEDULE SHIFTS

An arbitrator upheld an employer's right to reschedule shifts so as to avoid the payment of time and one-half. Where two employers scheduled shifts in non-continuous operations which limited weekly hours to 40, thereby preventing overtime, and made six consecutive days' work impossible, an arbitrator held that they did not violate their contracts or a WLB order which provided that:

"Employees who are working on a regularly scheduled day of 8 hours or more shall receive time and one-half for the sixth consecutive day and double time for the seventh consecutive day worked in the scheduled work week."

The companies' contracts called for a normal 36-hour week with time and one-half for work over 8 hours a day, 40 hours a week, or for work on the sixth day (where the employee is scheduled to work eight hours a day).

The companies contended that the only manner in which they could avoid

* In this classification, items marked with an asterisk also are considered to be trend indicators.

IT'S THE KNURLING THAT COUNTS

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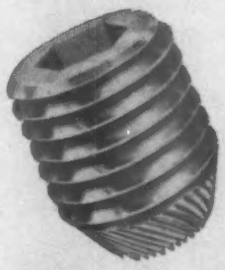

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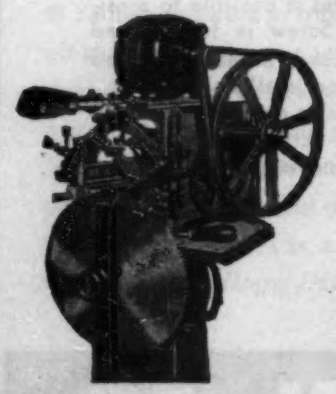

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the overtime, and still provide 40 hours' work with three shifts, was to eliminate continuity of working days. The arbitrator decided that the companies were not prohibited by virtue of the WLB order from introducing work days of less than 8 hours each. Nor would they be obligated, on the new schedule, to pay time and one-half for all hours worked on the sixth day if the preceding days worked did not total 40 hours. (Pittsburgh Plate Glass Company, Libbey-Owens-Ford Glass Company and Glass, Ceramic, & Silica Sand Workers-CIO)

While an employer has the right to assign work schedules, he may not, according to an arbitrator, require an employee to work on his regular day off and take a regular work day off so that overtime pay is avoided. Once work assignments have been made, they may not be changed arbitrarily for the sole purpose of avoiding premium payments. Thus, bus drivers who were required to work on their weekend off every 6 weeks were awarded overtime for work performed on such days. (In re arbitration between Hudson County Bus Owners' Association and Amalgamated Association of Street, Electric Railway, & Motor Coach Employees)

*MANAGEMENT'S RIGHT TO MAKE SHOP RULES

In the absence of contractual provisions on the subject of plant or working rules, management has the right to formulate, publicize, and enforce such rules. Such was the decision of an arbitrator in a case in which an employer unilaterally issued shop rules where no provision for such was made.

The union claimed that work rules are a matter for negotiation, and cited in support of its position the decision of the NLRB in the Timken Roller Bearing case.

The arbitrator decided that any conditions not covered by the contract are subject to unilateral company action, but "thereafter it would be incumbent upon the company to negotiate with respect to such rules as do affect working conditions or the right to bargain collectively." In this case, the employer had the right to establish the rules, but the union is equally entitled to attack individual rules on the ground that they violate the contract, are unfair, or affect employees' working conditions, and therefore should be subject to the collective bargaining process. (In re arbitration between Federal Machine & Welder Company and United Electrical Workers)

*MANAGEMENT'S RIGHT TO FILL VACANCY

A contract clause providing that seniority shall be the determining factor in promotion when ability to perform the work is relatively equal, does not prevent management from filling a vacancy from the outside in cases of exceptional circumstances.

In one case, the company claimed that

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the contract clause placed no limitations on the company's right to hire from the outside. The union, on the other hand, argued that the clause required the employer to give first consideration to qualified employees in the plant for promotion whenever a vacancy occurred, before recruiting personnel from the outside. The union, on the other hand, moting from within in this case principally on the ground that there was difficulty in replacing promoted employees in the lower labor grades.

The arbitrator declared that in the present labor market, strict adherence to the promotion from within policy would create the unfillable vacancies in the lower labor grades, as contended by management. However, wherever possible, in a normal labor market, promotion from within of qualified employees is preferable to original recruitment from outside the plant.

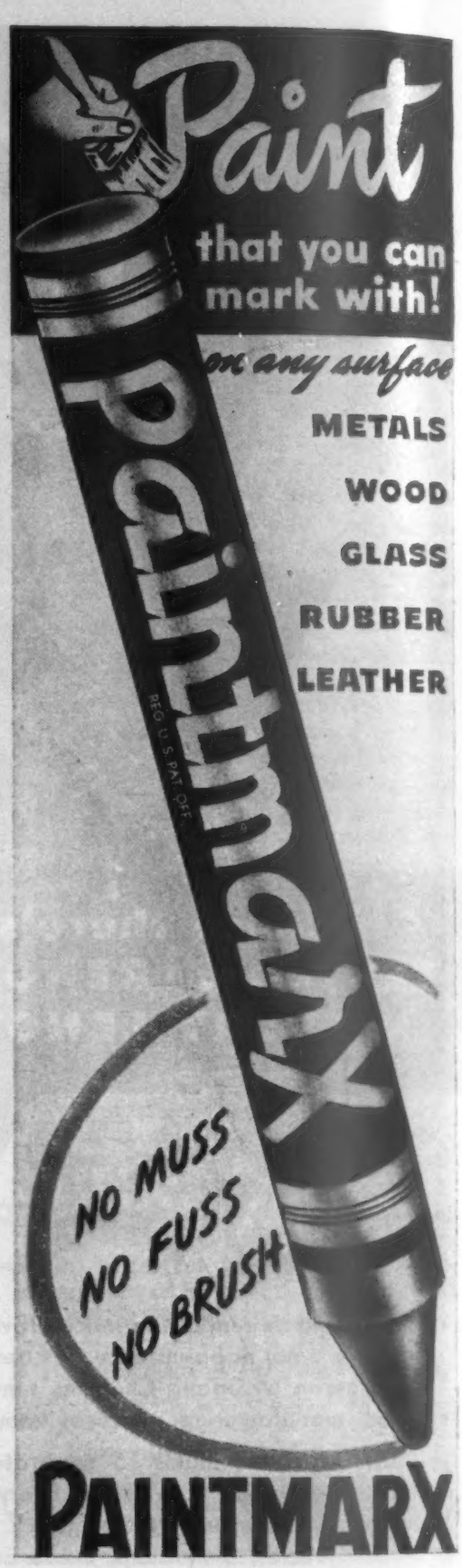
The arbitrator recognized the fact that to permit unrestricted outside hiring would increase discontent and lower morale. However, he pointed out that the clause prevents a "job freeze" since it clearly contemplates that promotions from within would be the normal practice. Moreover, the parties are not prevented, by such decision, from negotiating a more specific and satisfactory clause covering the relationship between internal promotion and original recruitment from the outside. (In re arbitration between Otis Elevator Company, and United Automobile, Aircraft, & Agricultural Implement Workers of America)

***SUSPENSION OF CONTRACT FOR BREACH**

An arbitrator held an employer entitled to suspend his contract with the union where the employees struck in violation of the no-strike clause of the contract. Thus, the employer was not obligated to rehire strikers in jobs filled by replacements during the strike, despite the seniority provisions of the contract which would normally require their displacement by employees with greater seniority. The arbitrator pointed out that the employer acted within his rights in hiring replacements during the strike, since the strike was an economic one not caused by an unfair labor practice, and by virtue of a U. S. Supreme Court decision, the participants of an economic strike have no claim over replacements hired during the strike. Moreover, the fact that the contract became operative after the strike does not give the strikers priority to their former jobs. (In re arbitration between Lancaster Iron Works, Inc., and United Steel Workers of America)

EMPLOYER'S SPEECH TO CAPTIVE AUDIENCE HELD NOT COERCIVE

According to a circuit court of appeals, the fact that the employer's speech to a "captive audience" occured on company time in the plant did not make it illegal but was a convenient method of communicating with the employees. The



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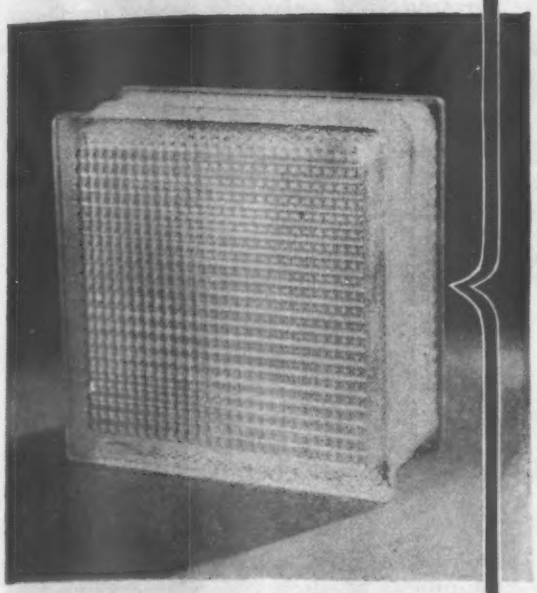

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LABOR DEVELOPMENTS *(continued)*

court, contrary to the NLRB's opinion in a previous case, ruled that the occasion on which the employer elects to utter his thoughts is not to be considered an element of coercion. (NLRB v. Montgomery Ward & Company, Inc., CCA-8)

***BACK PAY AWARDED**

Back pay was granted an employee where the employer called a junior employee in to work when two other employees were available who had greater seniority. The arbitrator refused to grant the union's request that the two union employees be recompensed on the ground that only one senior employee would have been employed in any case. (In re arbitration between St. Regis Paper Company and International Chemical Workers Union)

***UNILATERAL WAGE INCREASE HELD NOT INTERFERENCE**

Wage increases granted by the employer during the period of the union's organizational efforts were held not to be interference, since there was nothing to indicate any relation between the wage increase and the union activities of any of the employees. The raise was granted to all operators upon the employer's finding that the increased rate was that prevailing among other companies in the same industry, and that payment of such rate was necessary to attract personnel. (Radio Station WFHR, NLRB)

Likewise, a retroactive wage increase, granted during a union campaign to seven employees who had resigned from the union, was not considered an act of interference where the board found no evidence that the promised raise was the reason for the members' resignation. Though the board recognized that some assurance may have been given the employees when they resigned from the union that a wage increase would be given them when the question of recognition of the union was determined, no evidence was presented that such promise had been made. The employees maintained that they withdrew from the union because of its delay in obtaining increases for them. On the ground that the raise had been granted only to induce the men to stay at work, the board held the employer's action privileged. Connecticut Heat & Fuel Company, NLRB)

***ATTENDANCE AT UNION MEETINGS HELD NO WORK STOPPAGE**

Work stoppages effected by employees to attend union meetings were held legal where no contract existed prohibiting strikes. The Wisconsin Employment Relations Board ordered the union to cease and desist from interfering with production on the grounds that action other than leaving the company's premises in an orderly fashion for the purpose of striking was illegal. The circuit court of appeals, however, held such stoppages to constitute a strike and, as such, priv-

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Facts in figures

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ileged action on the part of the union. (Wisconsin ERB v. United Automobile Workers, Wisc. Cir. Ct. Milwaukee County)

UNION HELD RESPONSIBLE FOR EMPLOYEE'S FAILURE TO WORK

An arbitration board recently ordered inclusion in the contract of a clause making the union financially responsible for failure of employees to turn up for scheduled work or for leaving work without permission. The clause directed to be included, read as follows:

"When members of the union engage to take employment in any office and fail to report for work at the time agreed upon without having been excused by the foreman of the said intended position, or when any member shall walk out during working hours or leave his position without due notice, the union shall reimburse the employer at the rate of $4.50 per hour for the time lost on the press or presses the member is working on or was engaged on for that day or night, based on the regular working hours of the shift." (In re arbitration between R. R. Donnelley & Sons Company and International Printing Pressmen & Assistants' Union of North America)

*TAKING STRIKE VOTE HELD BREACH OF NO-STRIKE PLEDGE

The taking of a strike vote was held by an arbitrator to be in violation of a no-strike contract even though a strike did not ensue. The strike vote was taken by the union because of the employer's refusal to accede to the union's request to arbitrate certain disputes. The strike did not result, because of the employer's subsequent agreement to submit to arbitration. The arbitrator concluded that the "strike vote was in violation of the spirit and purpose of the no-strike clause of the agreement, and was a direct threat of economic pressure that had been studiously contracted against." Moreover, the arbitrator rejected the union's claim that the strike vote was justified by the employer's violation of the agreement by refusing to submit certain disputes to arbitration, since the issues were not arbitrable under the contract. On these grounds, the union was denied a maintenance-of-membership clause because of its display of irresponsibility. (In re arbitration between Lockheed Aircraft Corporation and Engineers & Architects Association of Southern California)

*UNEMPLOYMENT BENEFITS DENIED STRIKERS

The Veterans Administration recently denied the veterans in the General Motors strike unemployment benefits for the time lost during the strike. While the Veterans Administration recognized that veterans are entitled to such benefits in the face of a strike, it pointed out that their benefits are denied by the GI Bill of Rights when idleness is caused by "a stoppage of work which exists be-

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